

REVISION RECORD LOG

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Formula[®] 4000

REAR LOADER

PARTS & MAINTENANCE/ADJUSTMENT MANUAL

MR-74999-404



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INDEXES

This catalog has been developed into nine sections for easy access and use. The first eight sections contain the replacement parts on the Formula 4000 and arranged for easy identification of Heil service parts.

Section 9 contains information on maintenance/adjustment of the unit. It contains information on maintenance, adjustment, troubleshooting and hydraulic and electrical schematics.

UNDERSTANDING THE PARTS LISTING (IMPORTANT)

Understanding how to use the parts listing is important for proper use of this catalog. Below is a sample parts listing with four (4) columns. The first is the reference number column, the second is the part number column, the third is the descriptive column and the fourth is the number required column.

The numbers in the "REF." column are numbers corresponding with the circled reference numbers on the parts illustration for each replacement part.

The numbers in the "PART NUMBER" column are the numbers used to order particular replacement parts. Be sure when ordering parts, that the number is written correctly.

The "DESCRIPTION" column is used to describe the replacement parts. In this column will be found indented descriptions. These indented descriptions are a part of the preceding assembly or sub-assembly (see example below). In other words, the CONTROL VALVE ASSEMBLY is the main assembly and all indented descriptions under it are the parts that comprise the assembly. Also, in some cases, sub-assemblies may appear under an assembly. Again, the parts that comprise the sub-assembly will be indented under the sub-assembly. (See the Solenoid Assembly, Item 19 in the example below).

The quantities shown in the "REQ'D" column are the numbers of parts used on a unit, except where parts are indented in the description column. In this case, the quantity shown is the number required for the preceding assembly or sub-assembly. For example, check the quantities of the Solenoid Assembly (item 19 in example below). There is a quantity of 2 per each Unit. Now check the quantities for the indented items under the Solenoid Assembly. These quantities are for only one solenoid, not for the two.

PLEASE read each column carefully to ensure correct parts ordering.

MAIN ASSEMBLY		REF.	PART NO.	DESCRIPTION	REQ'D
ASSEMBLY PARTS			AO31A2044	VALVE, Control (consists of items 1 thru 37).....	1
			31-1881-01	VALVE, Pilot (consists of items 11 thru 19).....	1
		1	31A2044-24	CAPSCREW - 3/8" - 16 x 1-1/4" Long Gr. 5	8
		2	31A2044-28	CAP.....	2
SUB-ASSEMBLY		3	31A2044-27	"O"RING.....	2
		4	31A2044-26	SPRING.....	2
		5	31A2044-25	WASHER.....	2
		6	31a2044-23	SEAT, Spring.....	2
		18	31-1109-12	SPOOL, Pilot Valve.....	1
SUB-ASSEMBLY		19	31-1880-02	SOLENOID ASSEMBLY (Consists of items 20 thru 37).....	2
PARTS		20	31-1880-03	COIL.....	1
		21	31-1818-07	CASE.....	1

NOTES AND DESIGNATIONS

Illustrations and (or) parts listing may be shown with notes or designations which apply to specific models. Where an illustration and (or) parts listing is shown without notes or designations, this indicates the parts listing covers all models.

A/R = AS REQUIRED

NSS = NOT SERVICED SEPARATELY

Ref. = REFERENCE

CATALOG CHANGES

When changes to the unit make it necessary to revise portions of the catalog, revised pages will be issued with the same page number as those they replace and the issue date will be advanced.

SERIAL NUMBERS

The body serial plate is located on the left side front corner of the unit.

HOW TO ORDER PARTS

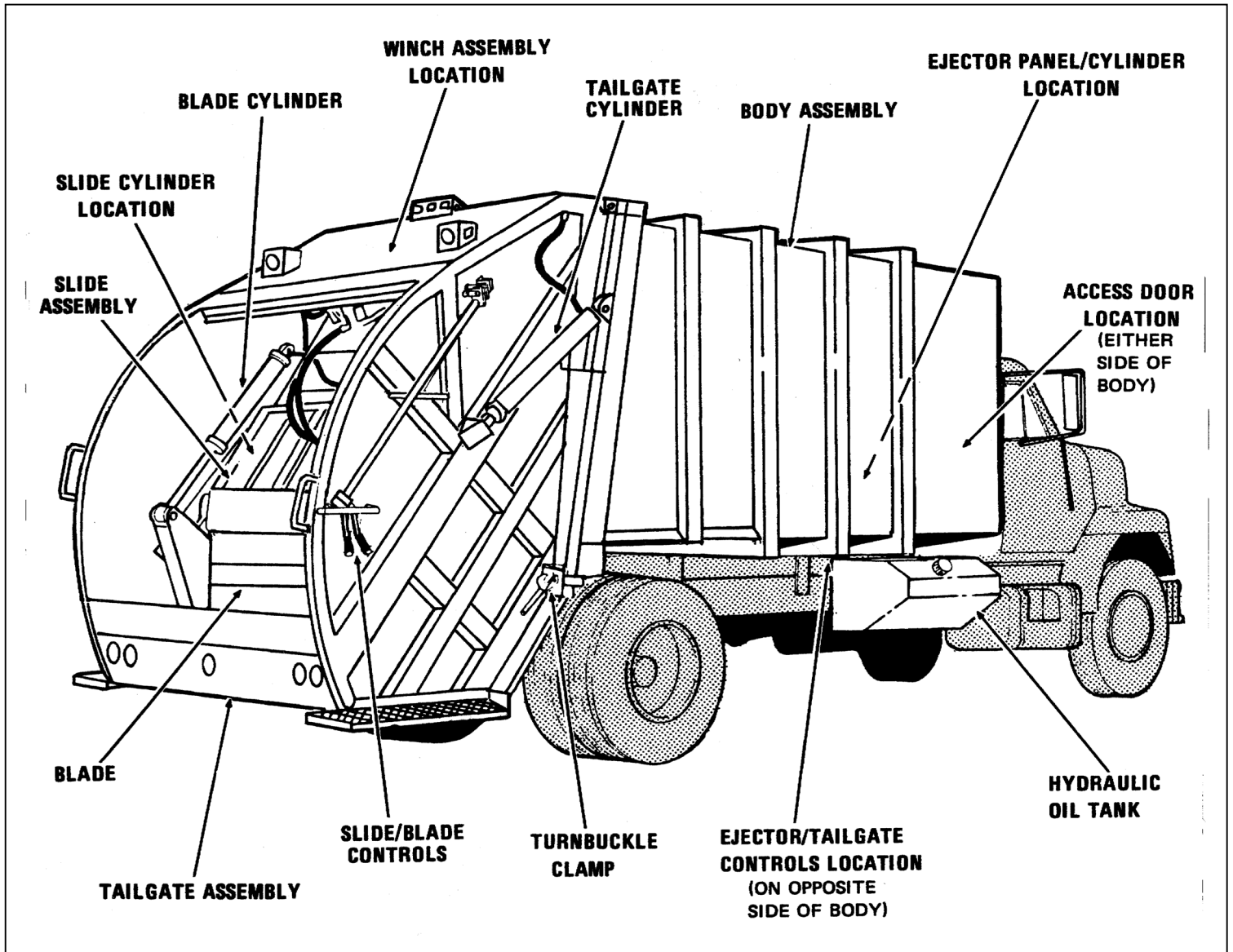
When ordering parts for a specific unit, always include the body and/or hopper model and serial number on your order. Order parts by description, part number and quantity desired.

Give specific instructions. We want your order to reach you as quickly and economically as possible.

Contact your HEIL distributor for parts and service.

HEIL Environmental Ind. Ltd.
Product Support Facility (Parts and Service)
4301 N. Gault Ave.
Ft. Payne, AL 35967
Phone: (256) 845-6446 (Customer Service)
(800) 251-7258 (Customer Service)
Fax: (256) 845-6477
(800) 298-4345 (Parts Orders only)

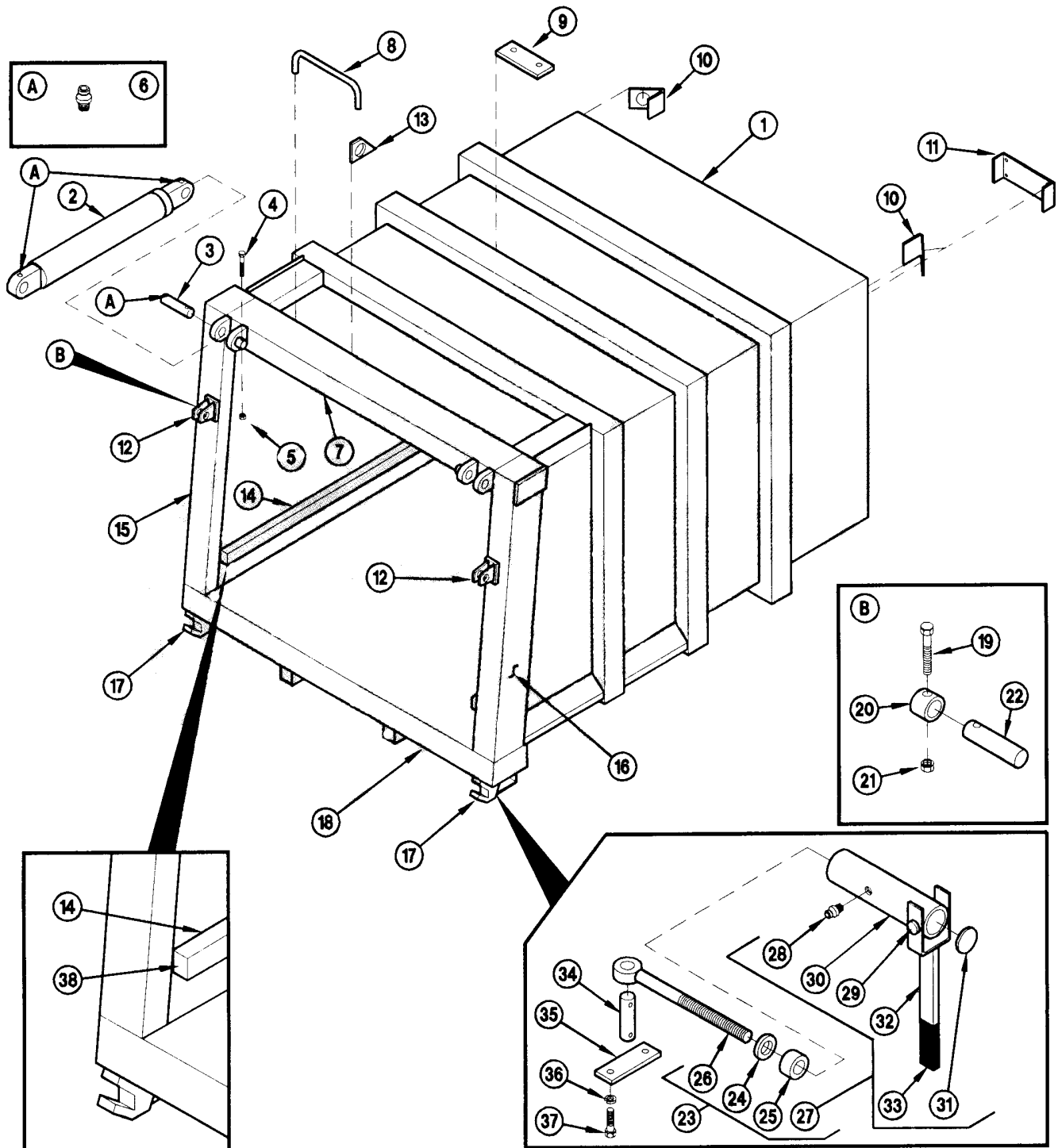
NOMENCLATURE



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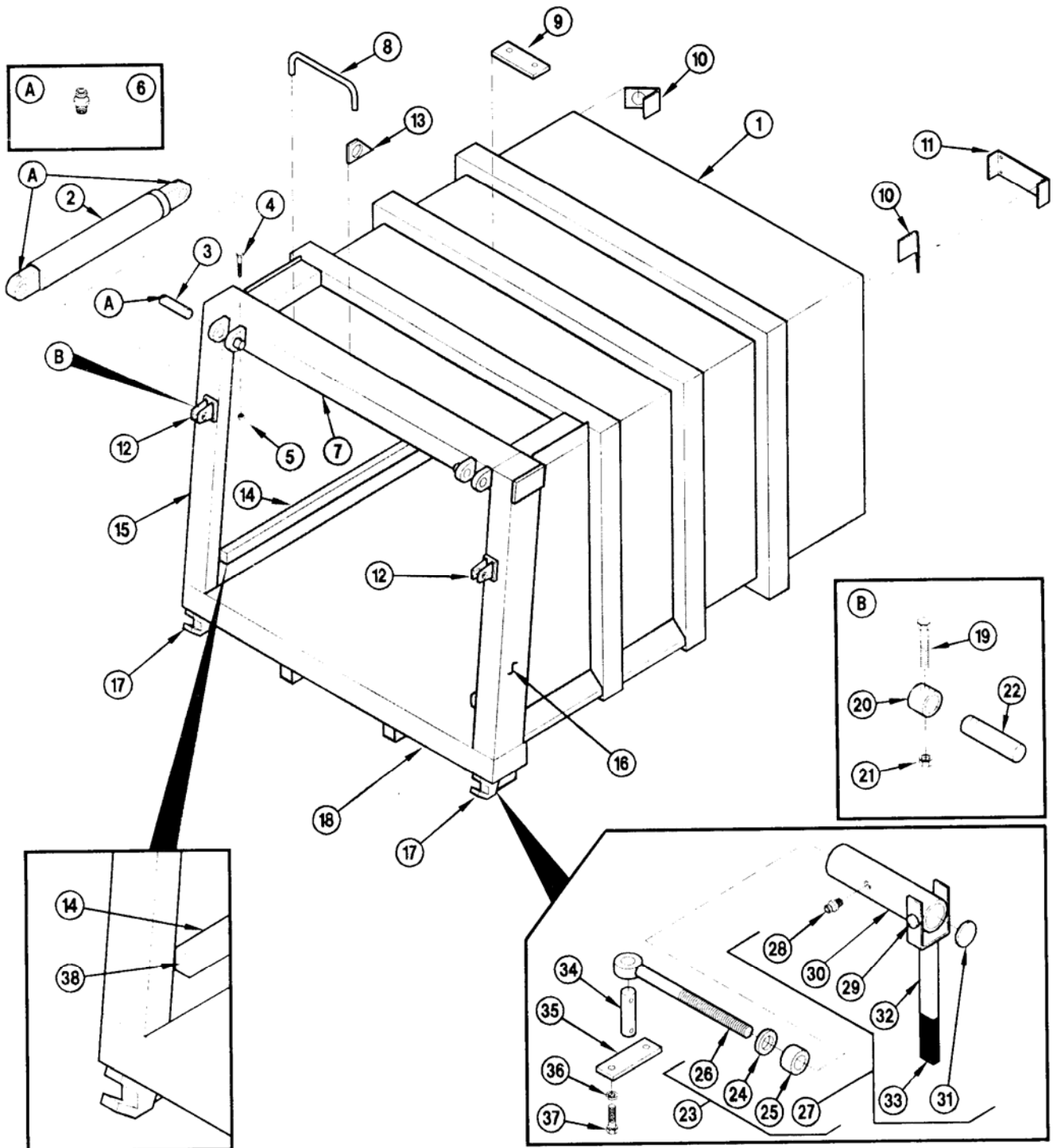
BODY and ATTACHING PARTS



FORMULA 4000**BODY and ATTACHING PARTS**

REF	PART NO.	DESCRIPTION	REQ'D
1	612-2573	BODY WELDMENT – 11 yd – 84" wide units	1
	612-2575	BODY WELDMENT – 14 yd. – 84" wide units	1
	612-2577	BODY WELDMENT – 16 yd – 84" wide units	1
	612-2579	BODY WELDMENT – 18 yd. – 84" wide units	1
	612-2562	BODY WELDMENT – 13 yd – 96" wide units	1
	612-2564	BODY WELDMENT – 16 yd. – 96" wide units	1
	612-2566	BODY WELDMENT – 18 yd – 96" wide units	1
	612-2568	BODY WELDMENT – 20 yd – 96" wide units	1
	612-2570	BODY WELDMENT – 25 yd – 96" wide units	1
2	REF.	CYLINDER, tailgate raise (see section 5)	2
3	048-2834	PIN, tailgate pivot	2
4	FS1010140	CAPSCREW – 1/2" – 20NF x 3'	2
5	FS241100	NUT, lock – 1/2" – 20NF	2
6	FS190400	FITTING, grease – 1/8" NPT x straight	6
7	177-2999	ROOF CROSSMEMBER – 84" wide units	1
	177-2577	ROOF CROSSMEMBER – 96" wide units	1
8	070-1103	GURAD, hose	1
9	126-2756	BRACE, clamp	A/R
10	211-7253	BRACKET, light	2
11	211-7103	BRACKET, logo	1
12	111-8273	BRACKET, tailgate cylinder	2
13	111-6354	TAB, lift	4
14	064-3317-001	RAIL, ejector – 11 yd – 84" wide & 13 yd – 96" wide units	2
	064-3317-002	RAIL, ejector – 14 yd – 84" wide & 16 yd – 96" wide units	2
	064-3317-003	RAIL, ejector – 16 yd – 84" wide & 18 yd – 96" wide units	2
	064-3317-004	RAIL, ejector – 18 yd – 84" wide & 20 yd – 96" wide units	2
	064-3317-005	RAIL, ejector – 25 yd – 96" wide units	2
15	111-8254	CORNERPOST ASSEMBLY – LH – 11 yd thru 20 yd units	1
	111-8278	CORNERPOST ASSEMBLY – LH - 25 yd units	1
16	111-8255	CORNERPOST ASSEMBLY – RH – 11 yd thru 20 yd units	1
	111-8279	CORNERPOST ASSEMBLY – RH - 25 yd units	1
17	005-3721	BRACKET, tailgate cylinder – (weldment)	2
18	177-2988	REAR CROSSMEMBER – 84" wide units	1
	077-8787	REAR CROSSMEMBER – 96" wide units	1

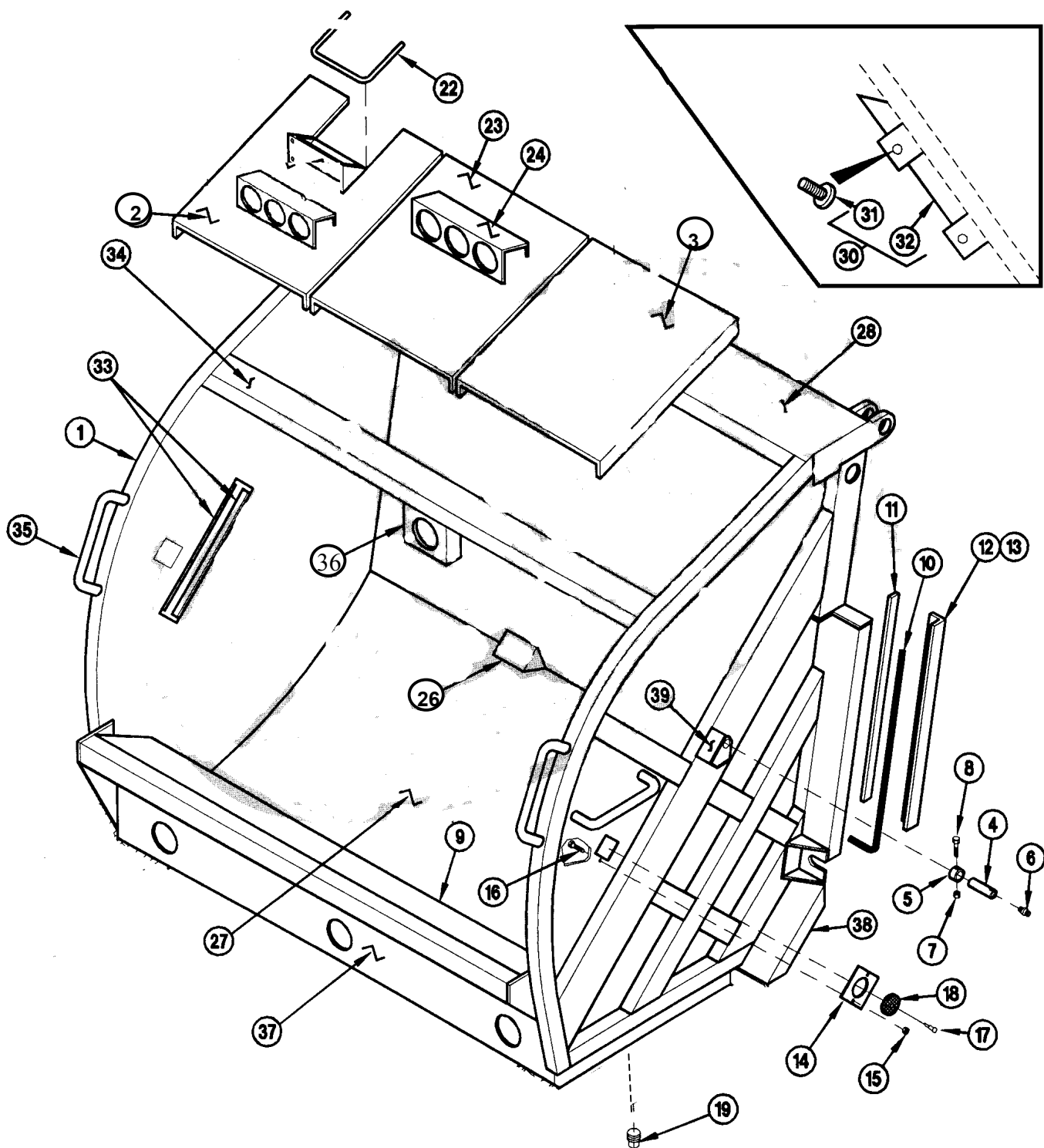
BODY and ATTACHING PARTS



BODY and ATTACHING PARTS

REF	PART NO.	DESCRIPTION	REQ'D
19	FS100932	CAPSCREW – 3/8" – 24NF x 2-1/4"	2
20	040-2218	COLLAR.....	2
21	FS240900	NUT, lock – 3/8" – 24NF.....	2
22	048-5482	PIN, tailgate raise cylinder.....	2
23	053-1908	HANDLE ASSEMBLY	2
24	055-0979	WASHER	1
25	204-8413	BEARING, thrust.....	1
26	204-8414	EYEBOLT	1
27	070-1460	HANDLE ASSEMBLY	1
28	FS190490	FITTING, grease.....	1
29	048-5492	PIN	1
30	204-8411	NUT	1
31	025-0420	PLUG	1
32	070-1443	HANDLE	1
33	070-1451	GRIP	1
34	048-5448	PIN	2
35	134-4061	PLATE, lock	2
36	FS540900	WASHER, lock – 3/8"	4
37	FS070915	CAPSCREW – 3/8" – 16NC x 3/4"	4
38	134-4129	CLOSURE	1

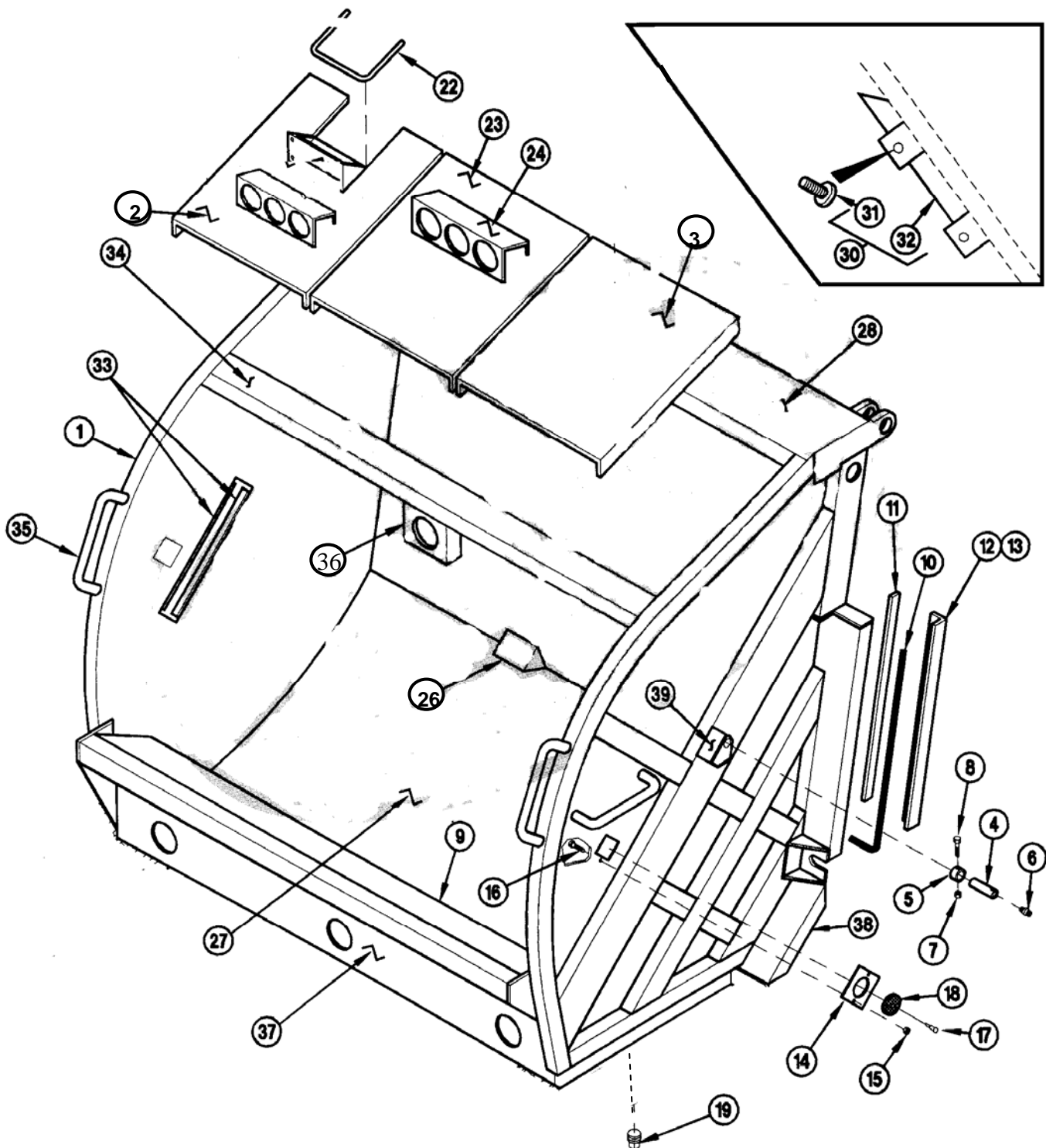
TAILGATE and ATTACHING PARTS



FORMULA 4000**TAILGATE and ATTACHING PARTS**

REF	PART NO.	DESCRIPTION	REQ'D
1	615-4381	TAILGATE – weldment – 13 thru 20 yd. – 84" wide	1
	615-1930	TAILGATE – weldment – (16, 18, 20 yd. – 96" wide units)	1
	615-1931	TAILGATE – weldment – (25 yd. units)	1
2	113-2484	COVER – L. H.	1
3	113-2485	COVER – R. H.	1
4	048-5482	PIN, tailgate raise cyl.	2
5	040-2218	COLLAR, pin	2
6	FS190490	FITTING, grease	2
7	FS240900	NUT, lock – 3/8" – 24NC	2
8	FS100930	CAPSCREW – 3/8" – 24nc x 2"	2
9	094-2114	LIP, hopper (84" wide units)	1
	094-1425	LIP, hopper (96" wide units)	1
10	022-3629	SEAL, tailgate (84" wide units)	1
	022-3118	SEAL, tailgate (96" wide units)	1
11	177-1060-003	BAR, support (84" wide units)	1
	177-1060-002	BAR, support (96" wide units)	1
12	177-1059-001	ANGLE, support	2
13	177-1059-002	ANGLE, support	3
14	112-2607	COVER, pin access	2
15	047-1727	NUT, lock – 1/4" – 20NC	4
16	FS070715	CAPSCREW – 1/4" – 20NC x 3/4"	4
17	047-1786	RIVET	2
18	115-0343	REFLECTOR – (red)	2
19	FS902001	PLUG, pipe – 1"	1
21	211-2658	BRACKET, logo	1
22	035-2647	GUARD, hose	1
23	112-6356	COVER	1
24	211-4322	BRACKET, light	1
26	080-1478	STOP, ejector	1
27	615-3972-025	LINER, hopper (84" wide units)	1
	615-1930-001	LINER, hopper (96" wide units)	1
28	177-3995	CROSSMEMBER, hinge-13/20 yd-84" wide units-	1
	177-3996	CROSSMEMBER, hinge-13/20 yd-96" wide units	1
	177-3997	CROSSMEMBER, hinge-25 yd-96" wide units-	1
30	077-9047	KIT, tailgate prop (includes items 31 & 32)	2
31	048-5643	PIN	1
32	077-9046	SUPPORT	1

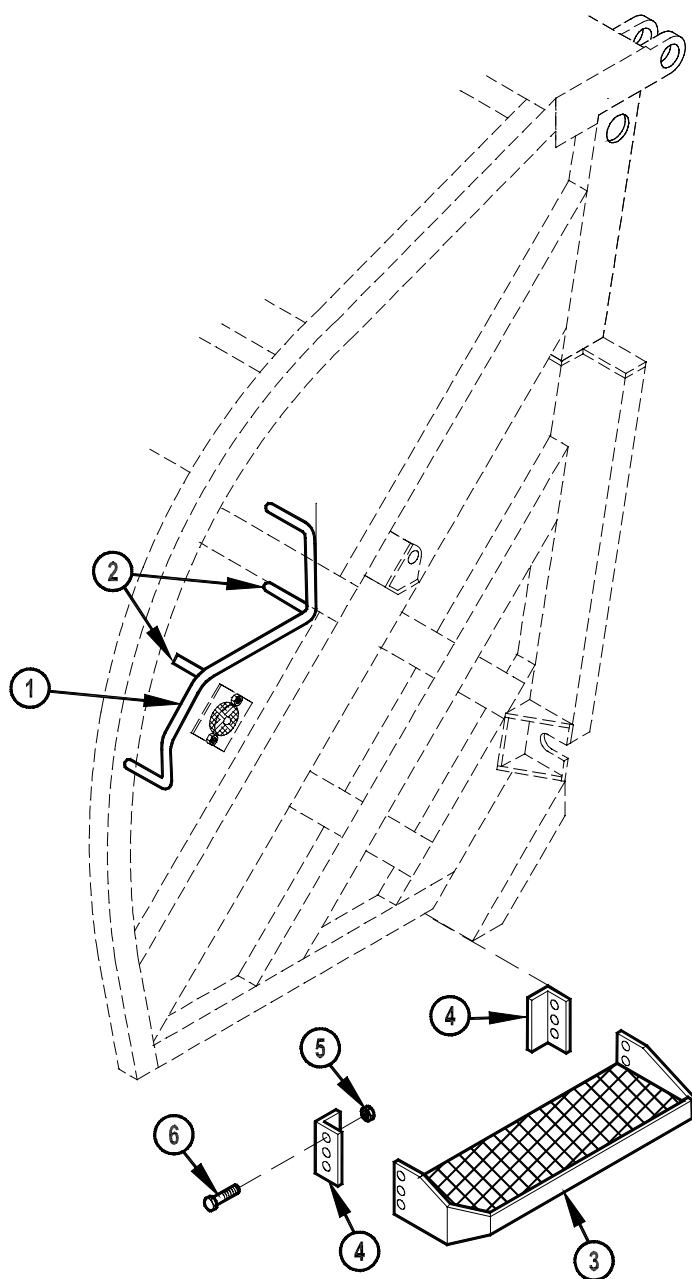
TAILGATE and ATTACHING PARTS



TAILGATE and ATTACHING PARTS

REF	PART NO.	DESCRIPTION	REQ'D
33	021-3376	BAR, bearing.....	4
34	177-2890	CROSSMEMBER, tailgate – (84" wide units).....	1
	177-1336	CROSSMEMBER, tailgate (96" wide units).....	1
35	070-1103	HANDLE	4
36	211-4239	BRACKET, stop light	1
37	177-3943	CROSSMEMBER, tail light (84" wide units)	1
	177-3882	CROSSMEMBER, tail light (96" wide units)	1
38	217-1187	FENDER – LH	1
	217-1186	FENDER – RH.....	1
39	077-7907	BRACKET – LH	1
	077-7906	BRACKET – RH	1

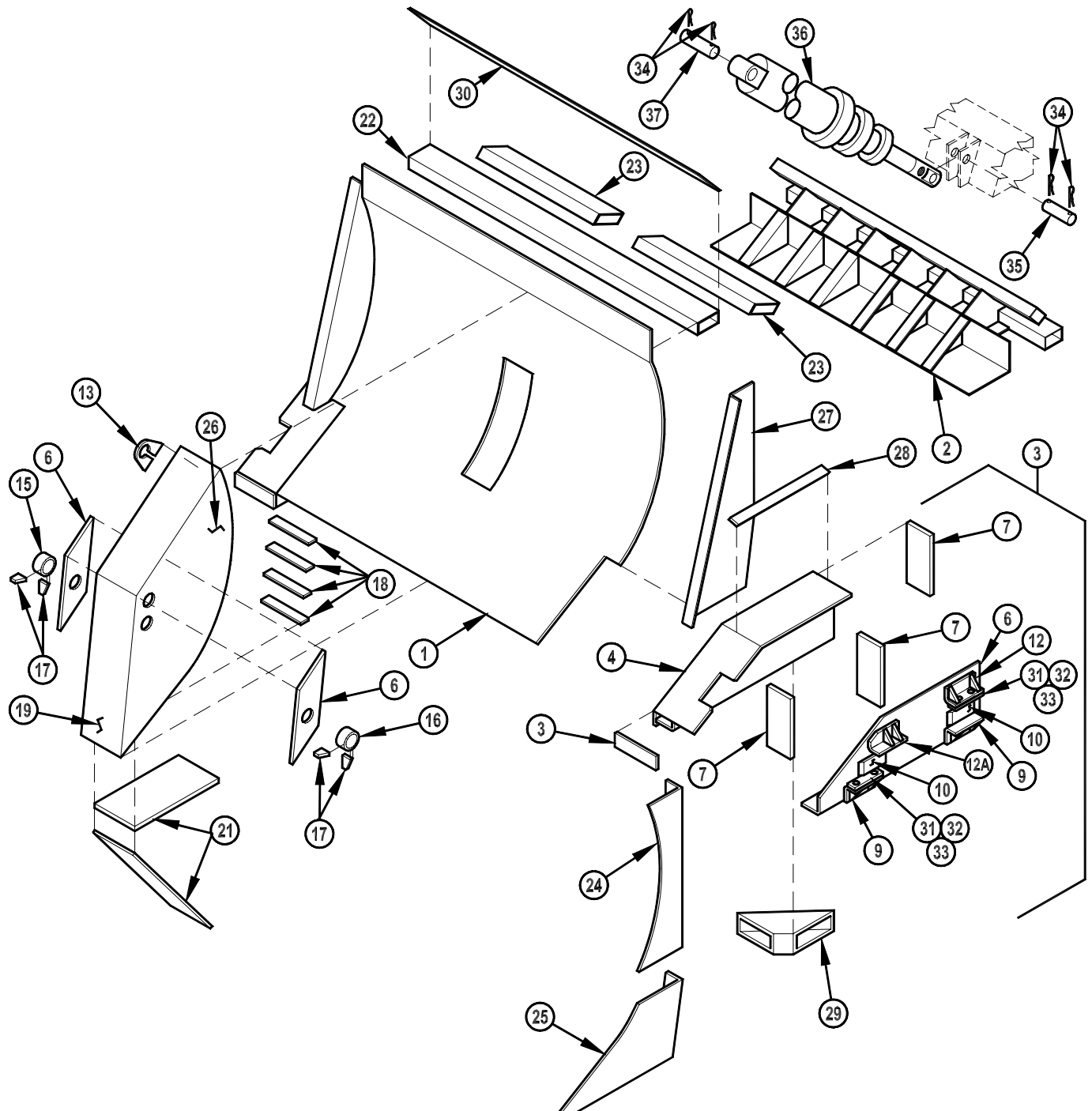
TAILGATE STEP ASSEMBLY



TAILGATE STEP ASSEMBLY

REF	PART NO.	DESCRIPTION	REQ'D
1	70-1722	HANDLE, grab – left hand	1
	70-1723	HANDLE, grab – right hand	1
2	70-1721	ROD, spacer.....	2
3	121-2106	STEP WELDMENT – left hand.....	1
	121-2107	STEP WELDMENT – right hand	1
4	126-4868	BRACKET	2
5	FS231300	NUT, lock – 1/2" – 13NC	6
6	FS071122	CAPSCREW – 1/2" – 13NC x 1-1/4"	6

EJECTOR PANEL and ATTACHING PARTS
237-8162 – for 13 THRU 20 YD. 96" WIDE UNITS
237-8164– for 25 YD. 96" WIDE UNITS
237-8163 – for ALL NARROW 84" WIDE UNITS

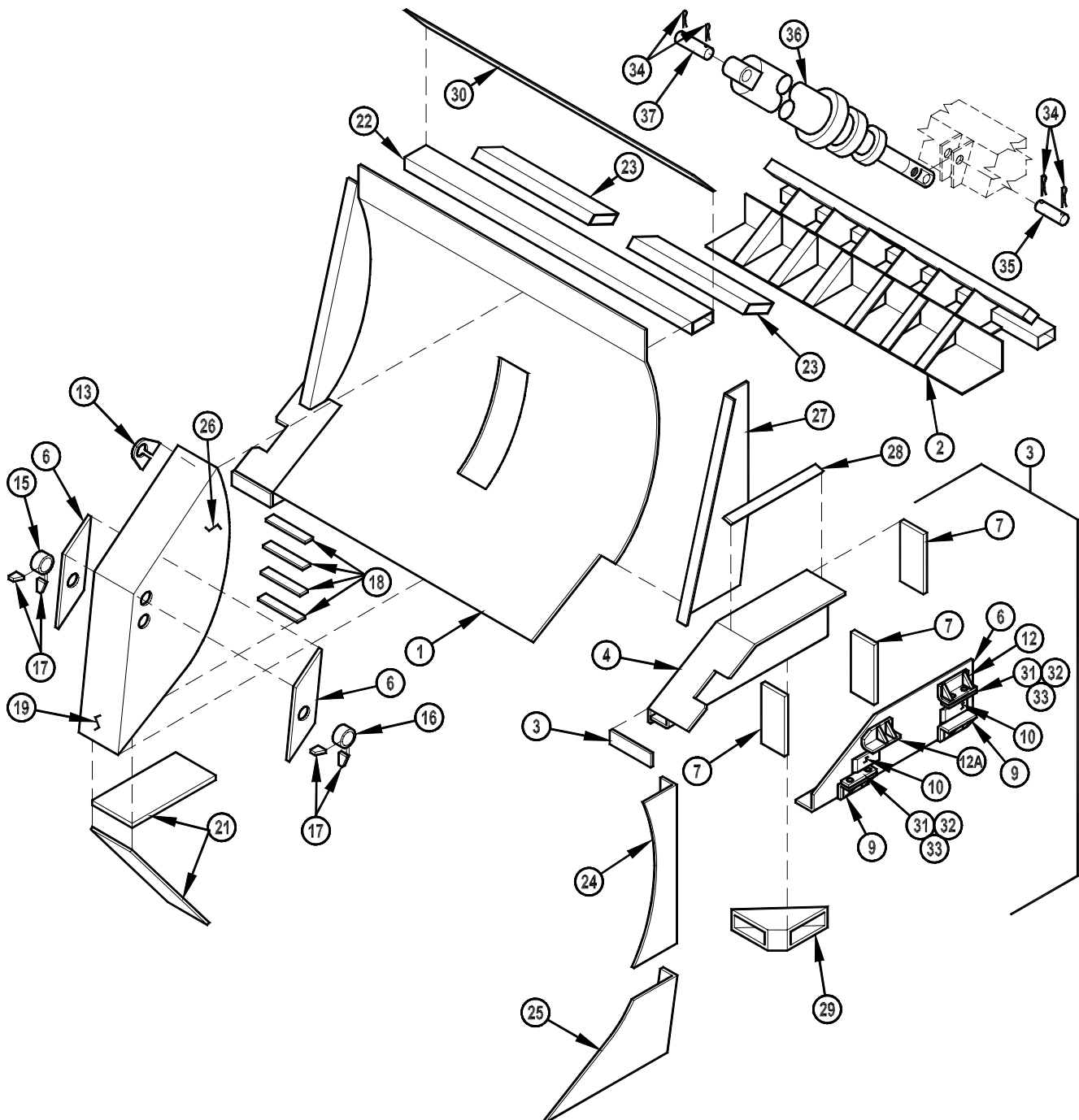


EJECTOR PANEL and ATTACHING PARTS
237-8162 – for 13 THRU 20 YD. 96” WIDE UNITS
237-8164 – for 25 YD. 96” WIDE UNITS
237-8163 – for ALL NARROW 84” WIDE UNITS

2.11

REF	PART NO.	DESCRIPTION	REQ'D
1	113-1364	FACE SHEET – weldment – for 237-8162 & 237-8164 panel....	1
	113-1365	FACE SHEET – weldment – for 237-8163 panel	1
2	177-3955	LOWER STRUCTURE – weldment.....	1
	177-3956	LOWER STRUCTURE – weldment – for 237-8163 panel.....	1
3	311-0829	ROLLER BRACKET ASSEMBLY – left hand.....	1
	311-0830	ROLLER BRACKET ASSEMBLY – right hand	1
4	311-0829-001	BRACKET, panel – left hand.....	1
	311-0829-002	BRACKET, panel – right hand	1
5	311-0336-003	CLOSURE, front	1
6	311-0336-004	BRACKET, panel – left hand.....	1
	311-0336-005	BRACKET, panel – right hand	1
7	311-0336-006	GUSSET, inner	2
8	211-7036-005	CLOSURE, rear	1
9	111-0829-005	ANGLE with hole	2
10	111-6887-008	BAR, spacer.....	2
11	111-0829-004	GUSSET	4
12	211-0829-003	ANGLE	1
12A	311-0829-006	ANGLE – left hand.....	1
	311-0829-007	ANGLE – right hand	1
13	237-8162-007	LUG, lift	1
14	237-5445-024	PLATE, snout brace	2
15	237-5445-025	BEARING.....	1
16	237-5445-026	BEARING.....	1
17	237-5445-027	GUSSET, bearing.....	4
18	237-5445-032	STIFFNER, snout front.....	4
19	237-8162-003	PLATE, snout cover.....	1
21	237-7369-003	PLATE, lower tunnel closure	2
22	237-8162-004	ANGLE, top.....	1
	237-8163-001	ANGLE, top – for 237-8163 panel.....	1
23	237-7369-005	BRACE, mid.....	2
	237-7370-002	BRACE, mid – for 237-8163 panel.....	2
24	237-8162-005	BRACE, upper rear – left hand	1
	237-8162-006	BRACE, upper rear – right hand	1
25	237-7369-008	BRACE, lower rear – left hand	1
	237-7369-009	BRACE, lower rear – right hand.....	1
26	237-7369-010	PLATE, side snout.....	2
27	237-8162-001	PLATE, side – left hand.....	1
	237-8162-002	PLATE, side – right hand	1
28	237-8162-008	PLATE, brace	2
29	237-7369-014	BRACE, corner	2
30	237-7371-001	BRACE, upper for 237-8162	2

EJECTOR PANEL and ATTACHING PARTS
237-8162- for 13 THRU 20 YD. 96" WIDE UNITS
237-8164 – for 25 YD. 96" WIDE UNITS
237-8163 – for ALL NARROW 84" WIDE UNITS



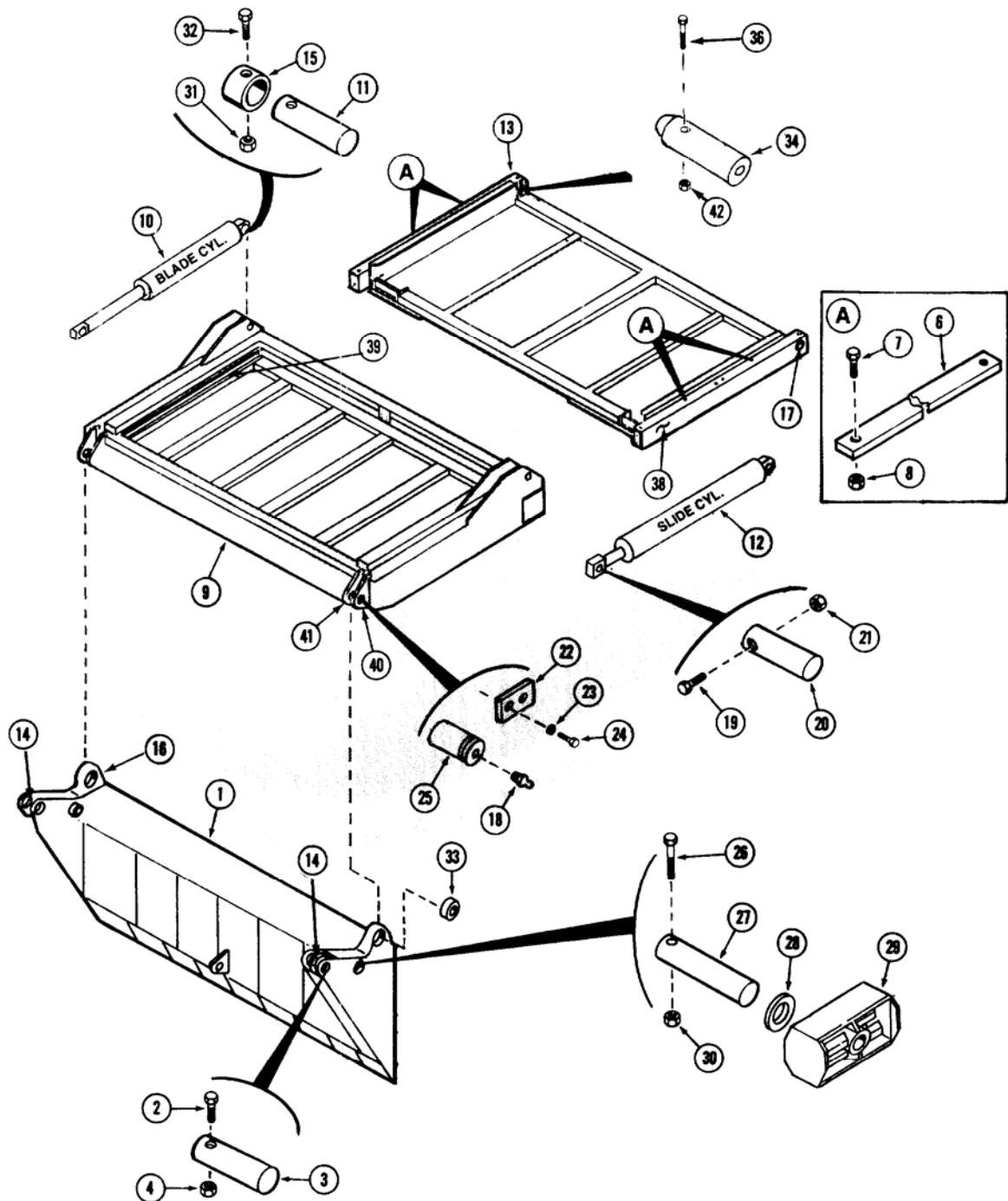
EJECTOR PANEL and ATTACHING PARTS
237-8162– for 13 THRU 20 YD. 96” WIDE UNITS
237-8164 – for 25 YD. 96” WIDE UNITS
237-8163 – for ALL NARROW 84” WIDE UNITS

REF	PART NO.	DESCRIPTION	REQ'D
31	021-3945	PAD, wear – bronze	4
32	FS410916	SCREW, button head – 3/8” – 16NC x 3/4”	8
33	FS230900	NUT, lock – 3/8” – 16NC	8

THESE ITEMS NOT INCLUDED IN EJECTOR PANEL

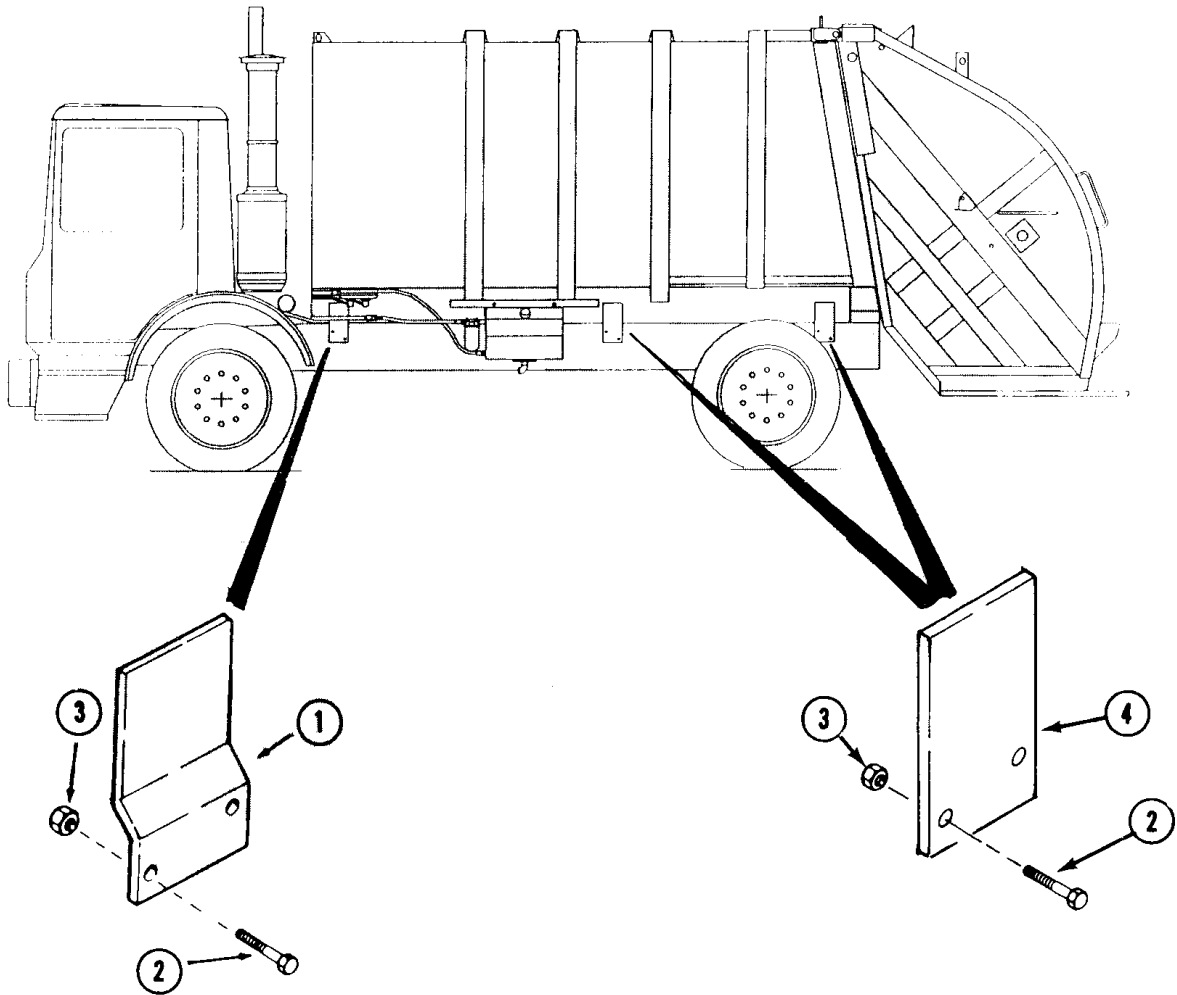
34	FS340640	PIN, cotter – 3/16” x 3”	4
35	048-5798	PIN, ejector cylinder rod end	1
36	REF.	CYLINDER, ejector (see section 5)	1
37	048-5799	PIN, ejector cylinder base end	1

PACKER BLADE, SLIDE and ATTACHING PARTS



PACKER BLADE, SLIDE and ATTACHING PARTS

REF	PART NO.	DESCRIPTION	REQ'D
1	113-1674-002	BLADE, packer – (84" wide units)	1
	113-1674-001	BLADE, packer - (96" wide units)	1
2	FS070940	CAPSCREW – 3/8" – 16NC x 3"	2
3	048-5549	PIN, blade cylinder rod end	2
4	FS230900	NUT, lock – 3/8" – 16NC	2
5	272-3303	KIT, outer slide bearing – Bronze (includes items 6 thru 8)	1
	272-3304	KIT, outer slide bearing – non-metallic – (includes items 6 thru 8)	1
	272-3874	KIT, outer slide bearing – bronze top & one-metallic bottom	1
6	003-3575	BEARING, slide (non-metallic) kits 272-3304/272-3874	4
	003-4117	BEARING, slide (bronze) kits 272-3303/272-3874	4
7	FS410916	SCREW, socket head – 3/8" – 16NC x 3/4"	A/R
8	FS230900	NUT, lock – 3/8" – 16NC	A/R
9	237-4968-99	SLIDE, outer (84" wide units – non-metallic)	1
	237-1998-99	SLIDE, outer (96" wide units – non-metallic)	1
10	REF.	CYLINDER, blade (see section 5)	2
11	048-5485	PIN, blade cyl. base end	2
12	REF.	CYLINDER, slide (see section 5)	2
13	237-4970-99	SLIDE, inner (84" wide units)	1
	037-9018-99	SLIDE, inner (96" wide units)	1
14	003-4008	BEARING – left hand	1
	003-4009	BEARING – right hand	1
15	040-2071	COLLAR	2
17	003-3333	BEARING	2
18	230-0001-08	FITTING, grease	A/R
19	FS071136	CAPSCREW – 1/2" – 13NC x 2-3/4"	4
20	048-3771	PIN, slide cyl. rod end	2
21	FS231100	NUT, lock – 1/2" – 13NC	4
22	021-3576	BAR, lock	2
23	FS541100	WASHER, lock – 1/2"	4
24	FS071122	CAPSCREW – 1/2" – 13NC x 1-1/2"	4
25	048-5550	PIN, blade to shoe	2
26	FS071344	CAPSCREW – 5/8" – 11NC x 3-1/2"	2
27	048-3777	PIN, blade to shoe	2
28	055-1119-001	WASHER	A/R
29	028-0358	SHOE	2
30	FS231300	NUT, lock – 5/8" – 11NC	2
31	FS240900	NUT, lock – 3/8" – 24NF	4
32	FS100936	CAPSCREW – 3/8" – 24NF x 2-3/4"	2
33	003-3906	BEARING	2
34	048-6001	PIN, slide 1-1/2" x 10.81"	2
36	FS101134	CAPSCREW – 1/2" – 20NF x 2-1/2"	2
38	037-9018-01	TUBE, inner slide	2
39	021-3298	BAR, slide bearing	4
40	021-3577	BAR, blade hinge	2
41	021-3122	BAR, blade hinge	2
42	FS241100	NUT, lock – 1/2" – 20NF	2

BODY TO CHASSIS MOUNTING PARTS

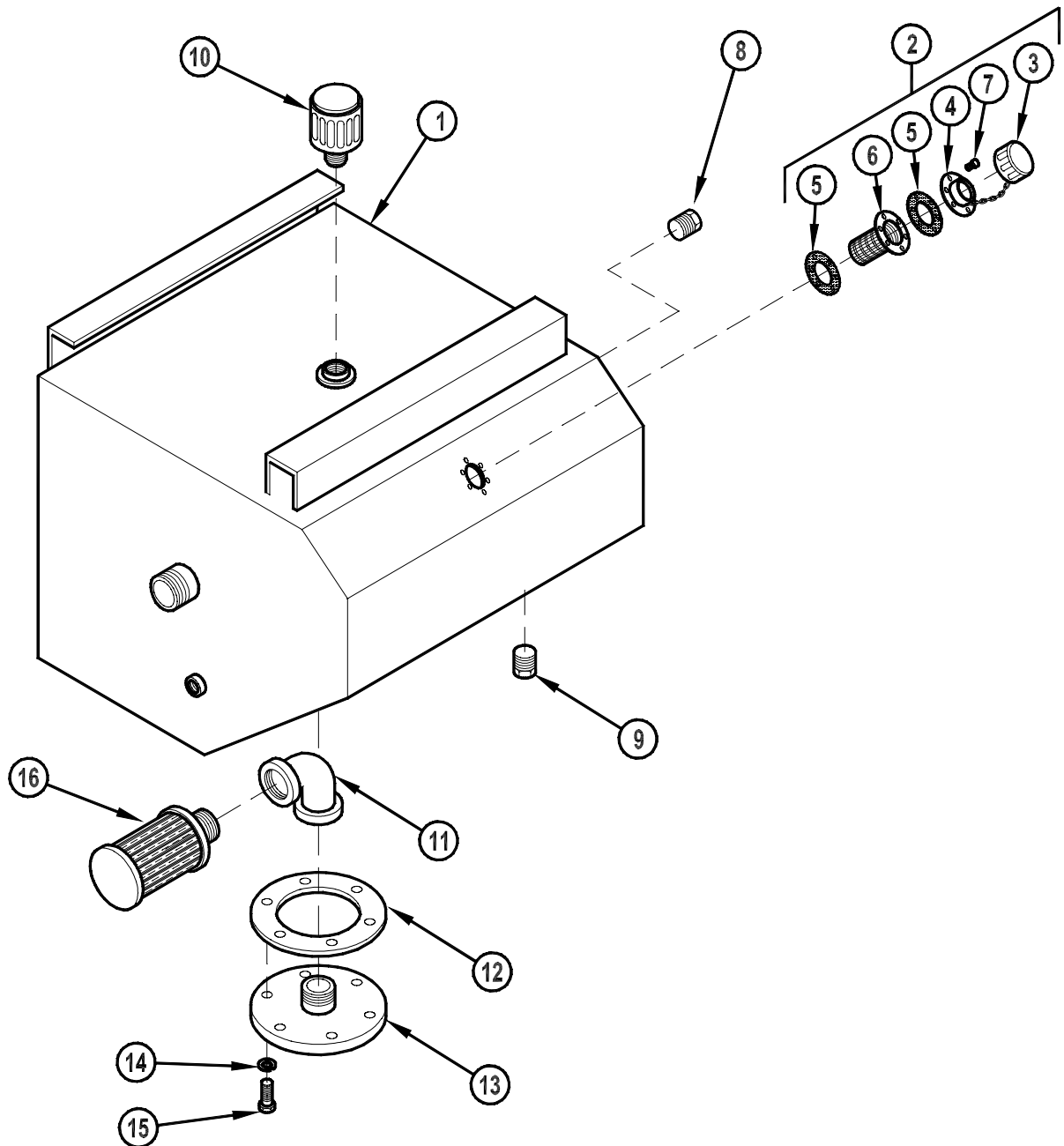
BODY TO CHASSIS MOUNTING PARTS

REF	PART NO.	DESCRIPTION	REQ'D
1	134-1744-002	PLATE, guide (see below)	2
2	FS071330	CAPSCREW – 5/8" – 11NC x 2"	A/R
3	FS231301	NUT, lock – 5/8" – 11NC	A/R
4	034-7783	TIE DOWN	A/R

NOTE:
OFFSET PLATES ARE AVAILABLE FOR THE VARIOUS
COMBINATIONS OF CHASSIS RAIL WIDTHS

PART NO.	OFFSET
134-1744-001	1/4 Inch
134-1744-002	3/8 Inch
134-1744-003	1/2 Inch
134-1744-004	3/4 Inch

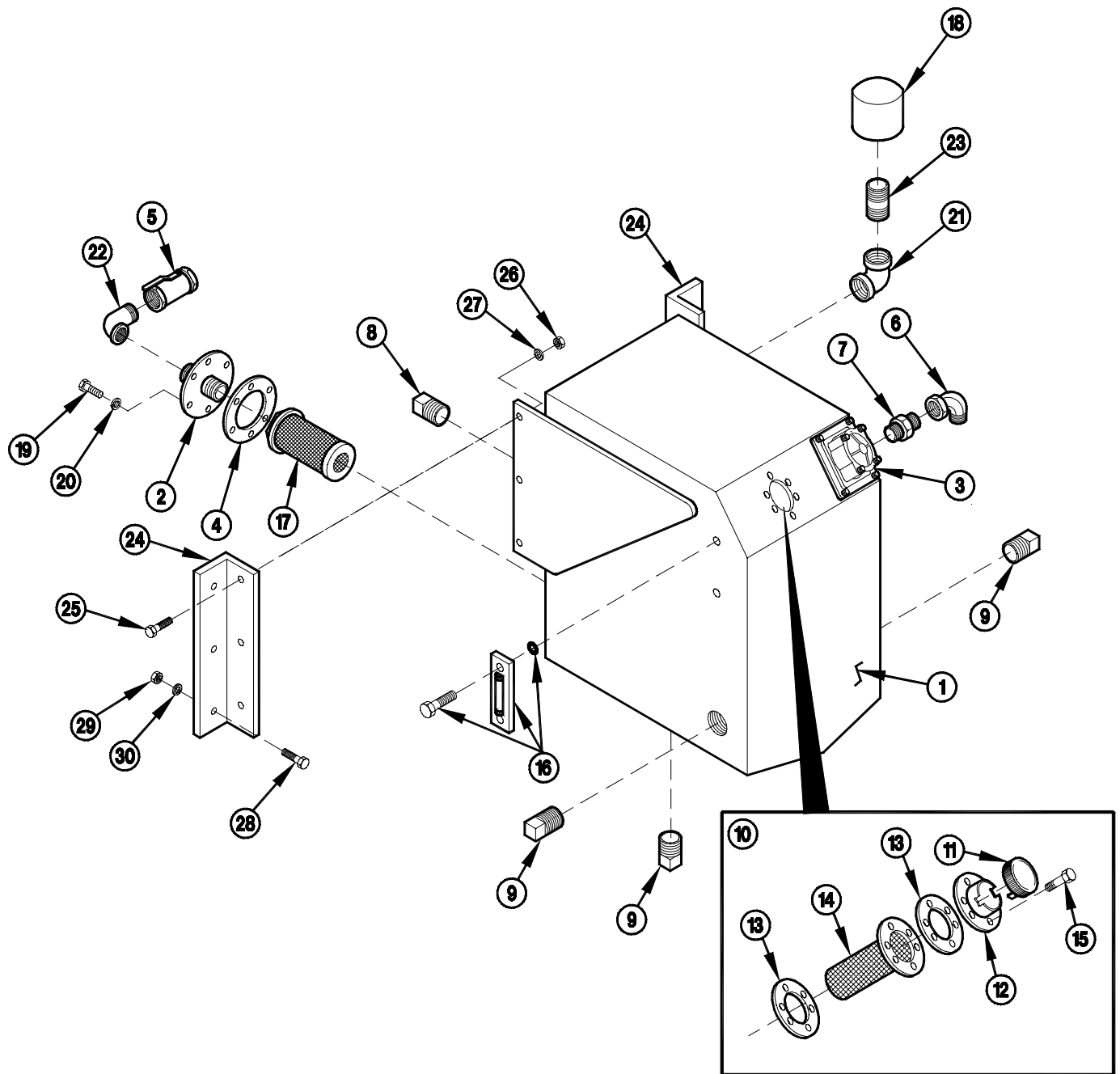
HYDRAULIC OIL TANK 020-2010



**HYDRAULIC OIL TANK
020-2010**

REF	PART NO.	DESCRIPTION	REQ'D
-	020-2010	TANK ASSEMBLY, oil.....	1
1	020-2011	TANK, oil – weldment.....	1
2	060-0417	FILL CAP ASSEMBLY.....	1
3	060-0417-001	CAP, fill – (chain is part of cap).....	1
4	060-0402-002	FLANGE.....	1
5	060-0402-003	GASKET.....	2
6	060-0402-004	STRAINER, oil (30 mesh).....	1
7	NSS	SCREW, self tapping - #10-24.....	6
8	FS900700	PLUG, pipe – 1/4".....	1
9	FS902001	PLUG, pipe – 1".....	1
10	060-0418	BREATHER ASSEMBLY.....	1
11	FS823000	ELBOW, 90° x 2".....	1
12	022-1240	GASKET.....	1
13	074-3624	FLANGE ASSEMBLY.....	1
14	FS540011	WASHER, lock – 1/2".....	6
15	FS071120	CAPSCREW – 1/2" – 13NC x 1".....	6
16	075-0570	STRAINER, suction (optional).....	1

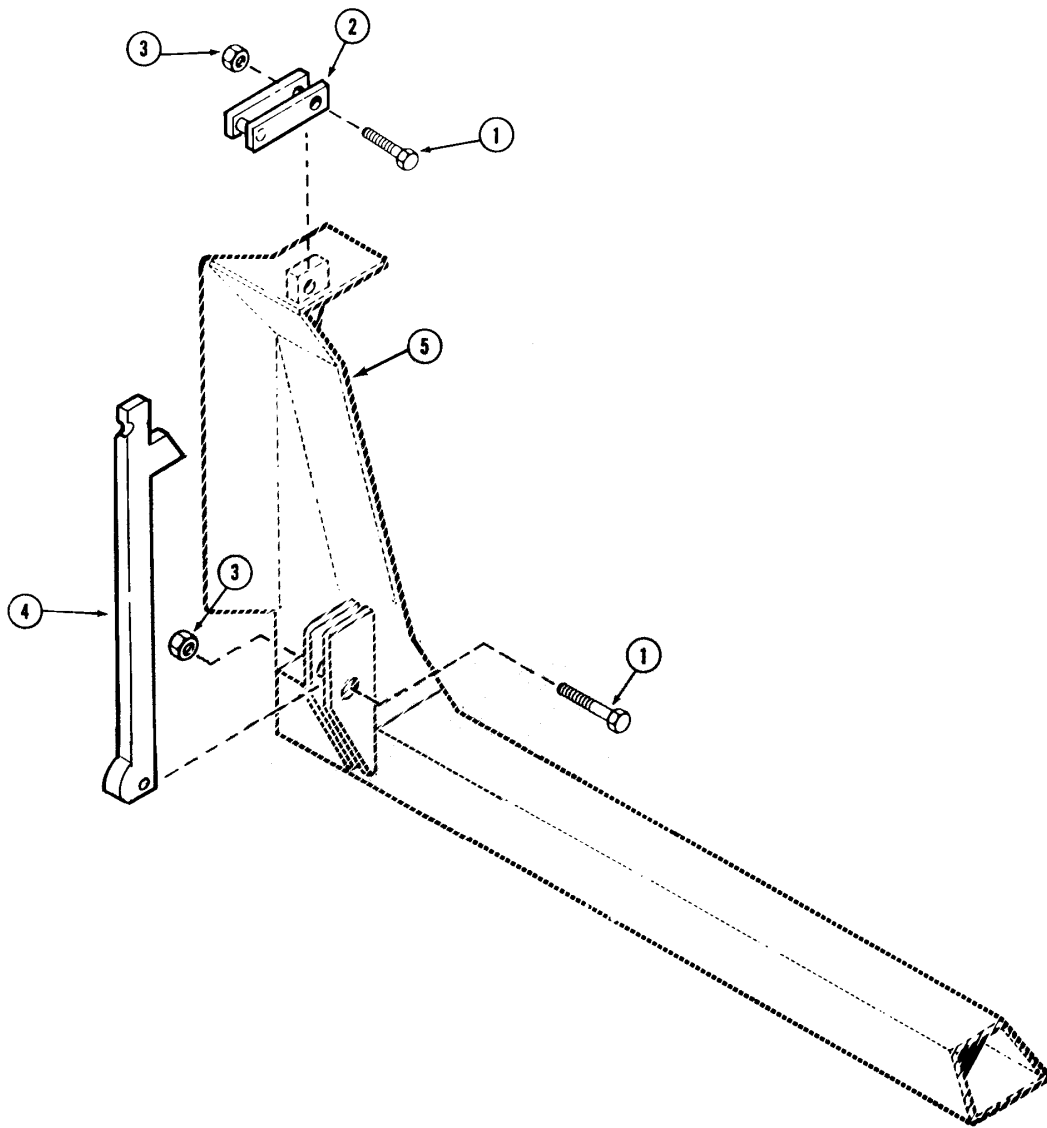
HYDRAULIC OIL TANK with IN-TANK FILTER 020-2326



**HYDRAULIC OIL TANK with IN-TANK FILTER
020-2326**

REF	PART NO.	DESCRIPTION	REQ'D
1	020-2284	TANK, oil (weldment)	1
2	074-3626	FLANGE	1
3	075-0724	FILTER, oil (see section 5)	1
4	022-2707	SEAL	1
5	031-2616	VALVE, shut-off	1
6	054-2988-010	ELBOW, 90°	1
7	058-3205-026	REDUCER	1
8	054-3342-005	PLUG	1
9	054-3342-010	PLUG	3
10	060-0417	FILL CAP ASSEMBLY	1
11	060-0417-001	CAP	1
12	060-0417-002	FLANGE	1
13	060-0417-003	GASKET	1
14	060-0417-004	STRAINER	1
15	NSS	SCREW, self tapping - #10 – 24	6
16	067-0630	THERMOMETER/SIGHT GAUGE	1
17	075-0578	STRAINER, suction	1
18	075-0712	FILTER/BREATHER – change every time filter is replaced	1
19	FS071120	CAPSCREW – 1/2" – 13NC x 1"	6
20	FS541100	WASHER, lock – 1/2"	6
21	FS781520	ELBOW, 90° reducing	1
22	FS823000	ELBOW, 90° street	1
23	FS881500	NIPPLE, close – 3/4"	1
24	211-4055	BRACKET, tank mounting	2
25	FS071124	CAPSCREW – 1/2" – 13NC x 1-1/2"	6
26	FS231100	NUT, lock – 1/2" – 13NC	6
27	FS521100	WASHER, flat – 1/2"	6
28	FS071334	CAPSCREW – 5/8" – 11NC x 2"	6
29	FS231300	NUT, lock – 5/8" – 11NC	6
30	055-1391-007	WASHER, flat – 5/8" hardened	6

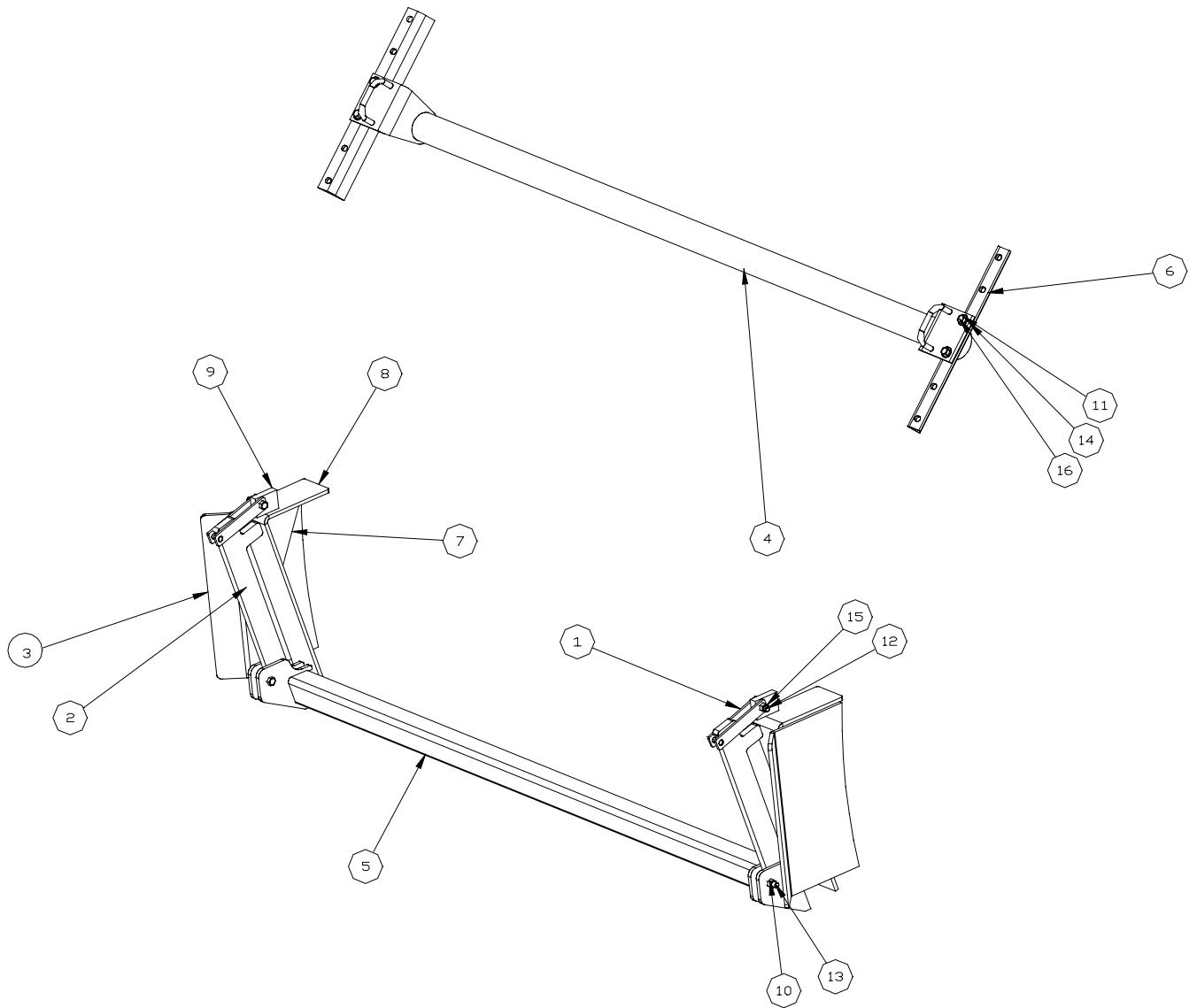
CONTAINER LIP and LATCH KITS
094-1504 – for CONTAINER ARM MECHANISM
094-1503 – for ALL OTHERS



**CONTAINER LIP and LATCH KITS
094-1504 – for CONTAINER ARM MECHANISM
094-1503 – for ALL OTHERS**

REF	PART NO.	DESCRIPTION	REQ'D
1	FS101130	CAPSCREW – 1/2" – 20NF x 2"	4
2	053-1558	LATCH ASSEMBLY	2
3	FS241100	NUT, lock – 1/2" – 20NF	4
4	053-1868	LATCH ASSEMBLY – for 093-1504 kit	1
	053-1871	LATCH ASSEMBLY – for 093-1504 kit	1
5	064-3045	GUIDE	2
6	211-1645	LUG	2

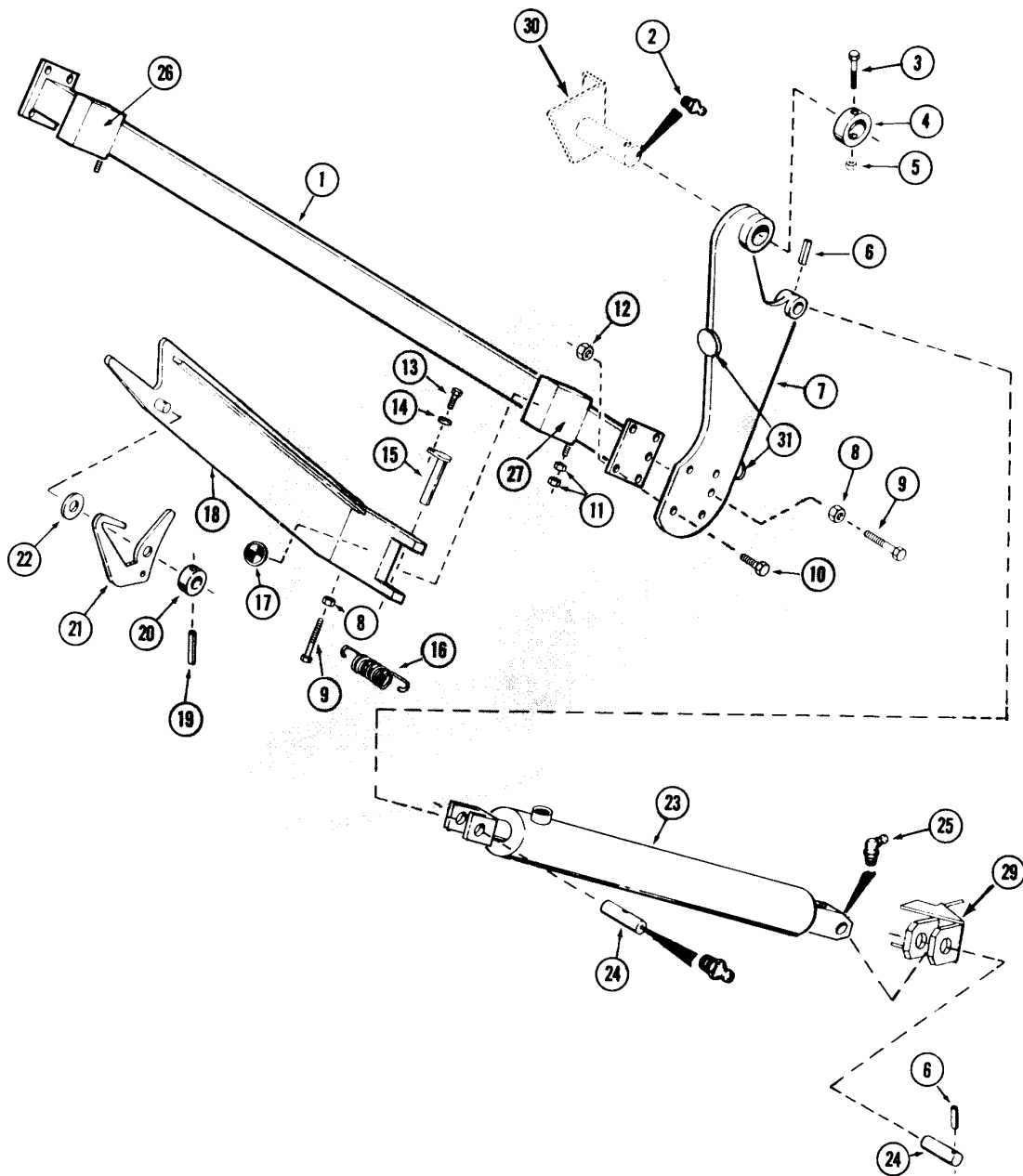
**LATCH KIT for WINCH, ROLL BAR OR REEVING KIT
372-2644**



**LATCH KIT for WINCH, ROLL BAR OR REEVING KIT
372-2644**

REF	PART NO.	DESCRIPTION	REQ'D
1	053-1558	LATCH ASSEMBLY	2
2	053-1868	BAR, latch	2
3	064-3755	GUIDE, container	2
4	077-6813	BAR, container support	1
5	094-2744	SHIELD, spill	1
6	126-3590	BRACE	2
7	177-2110	GUSSET	2
8	177-5322	SUPPORT	2
9	211-1646	BRACKET	2
10	234-2449	PLATE	4
11	FS071122	CAPSCREW – 1/2" – 13NC x 1-1/4"	4
12	FS101130	CAPSCREW – 1/2" – 20NF x 3-1/2"	2
13	FS101134	CAPSCREW – 1/2" – 20NF x 2-1/2"	2
14	FS231100	NUT, lock – 1/2" – 13NC	4
15	FS241100	NUT, lock – 1/2" – 20NF	4
16	FS521100	WASHER, flat – 1/2"	8

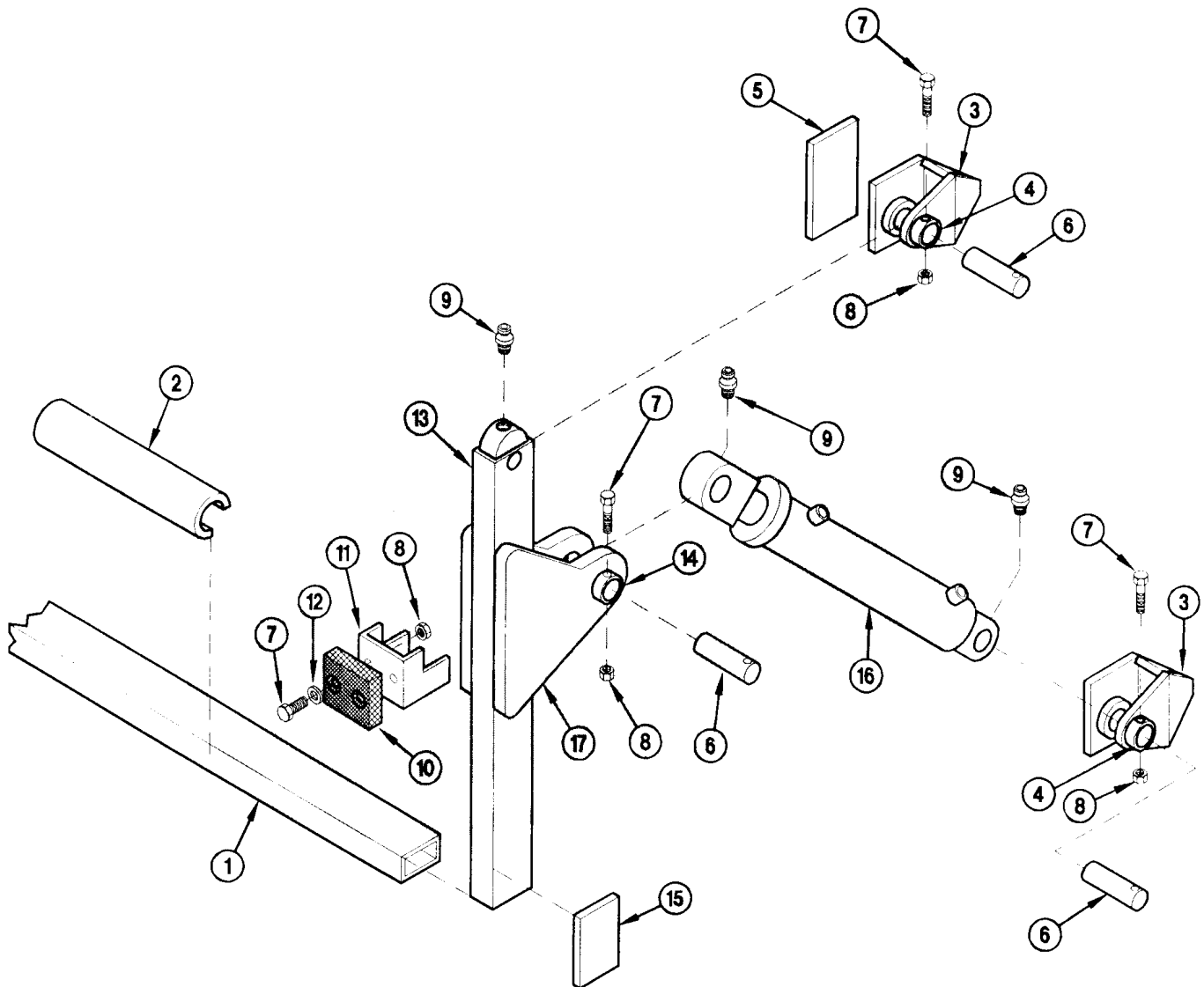
CONTAINER ARM MECHANISM



FORMULA 4000**CONTAINER ARM MECHANISM**

REF	PART NO.	DESCRIPTION	REQ'D
1	054-5038	TUBE, cross	1
2	230-0001-001	FITTING, grease	2
3	FS090932	CAPSCREW – 3/8" – 24NF x 2-1/4"	2
4	040-1606	COLLAR	2
5	FS240900	NUT, lock – 3/8" – 24NF	2
6	048-2270-017	PIN, roll	4
7	093-1375	ARM, side	2
8	FS301100	NUT, jam – 1/2" – 20NF	4
9	047-1210	BOLT – (special)	4
10	047-1530	BOLT – (special)	8
11	FS301100	NUT, jam – 1/2" – 20NF	4
12	FS240900	NUT, lock – 3/8" – 24NF	10
13	FS090915	CAPSCREW – 3/8" – 24NF x 3/4"	2
14	FS540900	WASHER, lock – 3/8"	2
15	048-3957	PIN	2
16	019-1041	SPRING, extension	2
17	115-0461	REFLECTOR	2
18	093-1735	ARM, lift – Left hand – shown	1
	093-1736	ARM, lift – right hand – not shown	1
19	048-2271-006	PIN, roll	1
20	040-1678	COLLAR	1
21	053-0897	LATCH	1
22	FS521500	WASHER, flat – 3/4"	1
23	REF.	CYLINDER, container arm (see section 5)	2
24	048-2852	PIN,	4
25	230-0001-008	FITTING, grease	2
26	040-2002	COLLAR – left hand	1
27	040-2003	COLLAR – right hand	1
29	211-2489	BRACKET, cylinder – left hand	1
	211-2490	BRACKET, cylinder – right hand	1
30	111-8624	BRACKET – left hand	1
	111-8625	BRACKET – right hand	1
31	080-1293	STOP	4

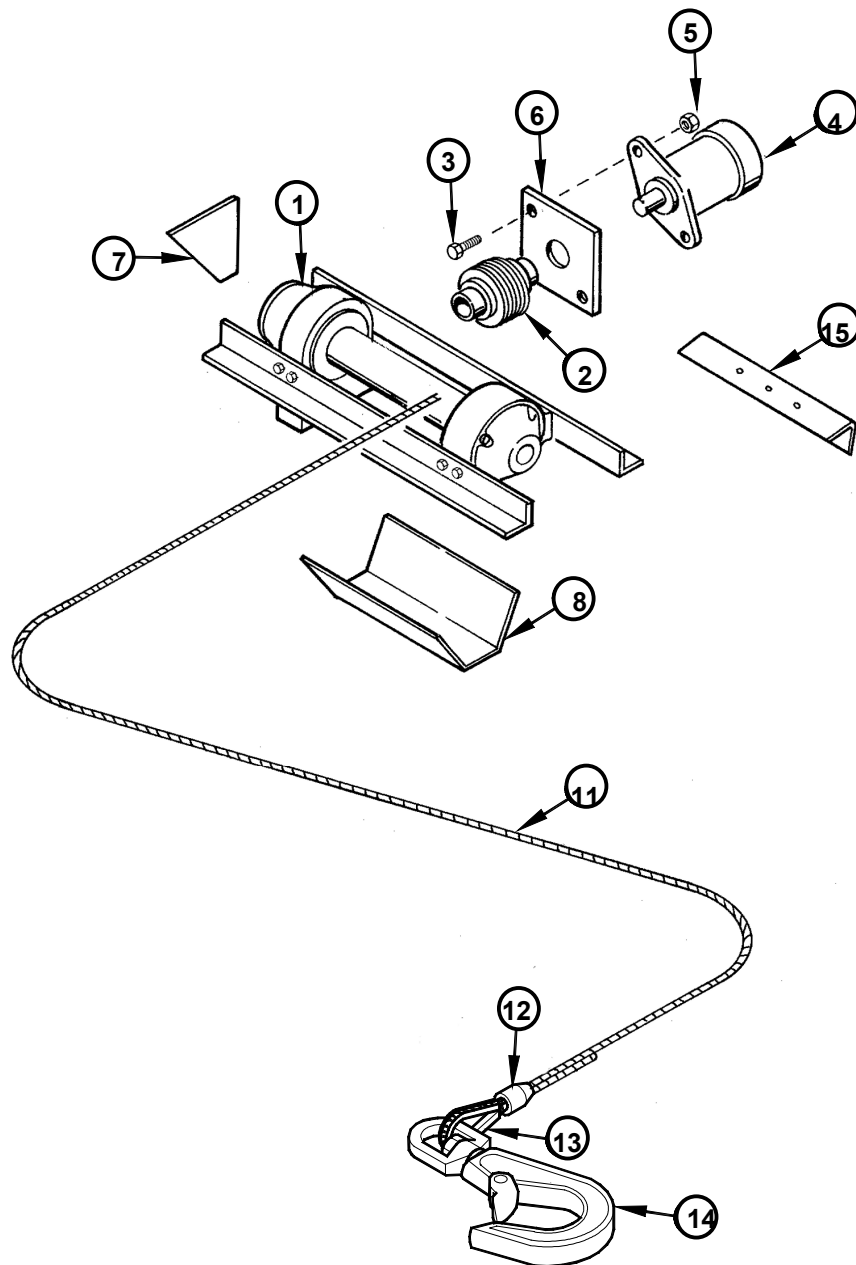
ROLL BAR MECHANISM



ROLL BAR MECHANISM

REF	PART NO.	DESCRIPTION	REQ'D
1	054-7878	TUBE, roll bar	1
2	207-2733	STRIP, wear	2
3	211-3292	BRACKET, cylinder – left hand	2
	211-3293	BRACKET, cylinder – right hand	2
4	040-2071	COLLAR	1
5	134-8281	PLATE, spacer	2
6	048-5371-044	PIN	6
7	FS100934	CAPSCREW – 3/8" – 24NF x 2-1/2"	A/R
8	FS240900	NUT, lock – 3/8" – 24NF	A/R
9	FS190400	FITTING, grease – 1/8" x straight	6
10	014-1415	PAD	2
11	211-5385	BRACKET, pad	2
12	FS510900	WASHER, flat – 3/8"	4
13	093-1968	ARM, lift – weldment – left hand	1
	093-1969	ARM, lift – weldment – right hand	1
14	040-2071	COLLAR	1
15	207-5188	PLATE	1
16	ref.	CYLINDER, roll bar (see section 5)	2
17	207-5185	PLATE	2

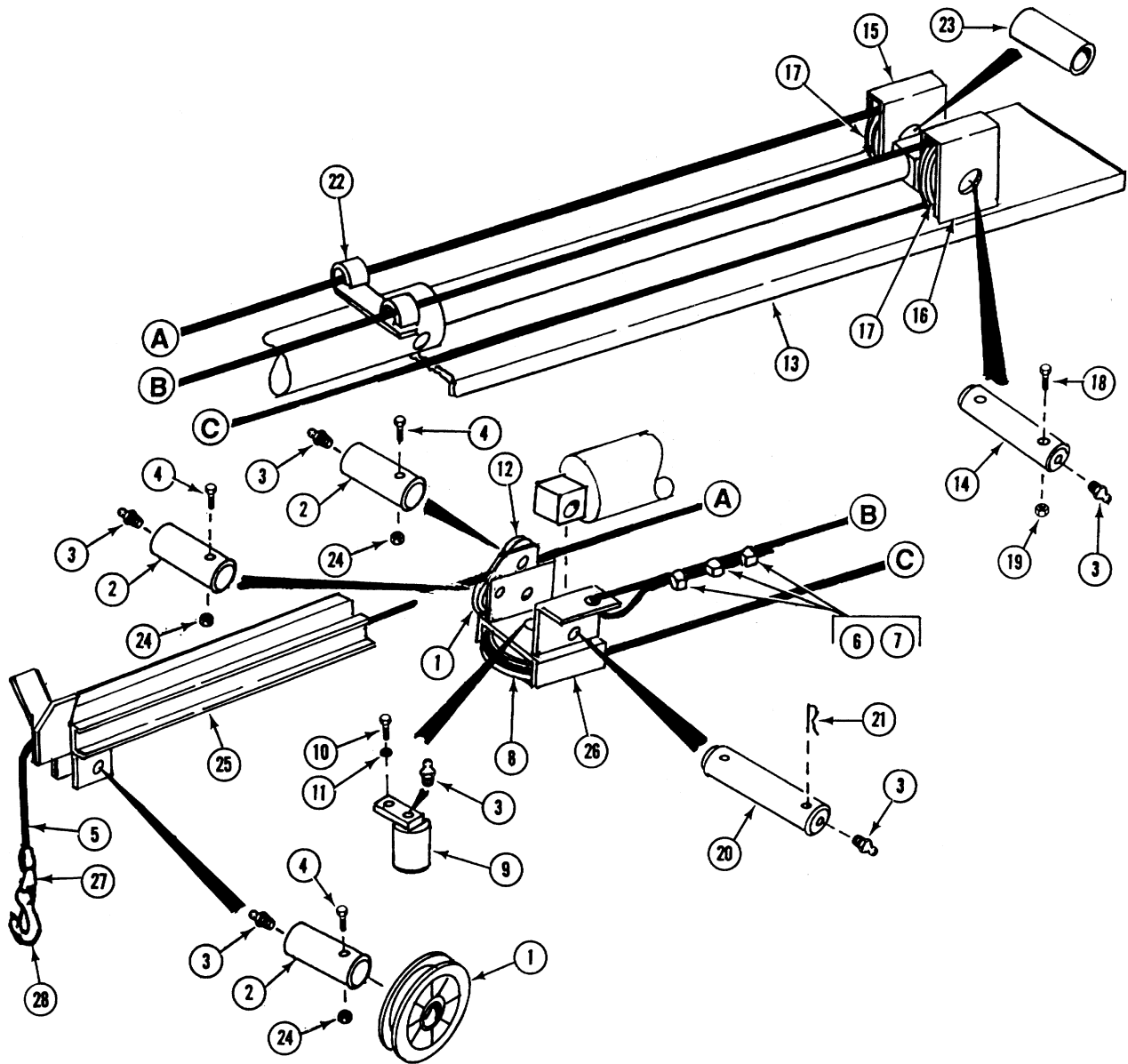
WINCH MECHANISM



WINCH MECHANISM

REF	PART NO.	DESCRIPTION	REQ'D
-	253-2292	WINCH ASSEMBLY – 8,000 lbs. (consists of items 1 thru 10) ...	1
-	253-1475	WINCH ASSEMBLY – 12,000 lbs. (consists of items 1 thru 10) .	1
1	REF.	WINCH – (See Section 5).....	1
2	045-0999	COUPLING – (for 12,000 lbs. Winch)	1
3	FS071124	CAPSCREW – 1/2" – 13NC x 1-1/2" – (for 8,000 lb. winch)...	2
	FS071130	CAPSCREW – 1/2" – 13NC X 2" – (FOR 12,000 lb. winch)...	2
4	REF.	MOTOR, winch – (See Section 5)	1
5	FS231100	NUT, lock – 1/2" – 13NC	2
6	211-0245	BRACKET – (for 12,000 lb. winch)	1
7	211-0244	GUSSET – (for 12,000 lb. winch)	1
8	112-4515	COVER – (for 8,000 lb. winch)	1
	112-4516	COVER – (for 12,000 lb. winch)	1
9	FS071120	CAPSCREW – 3/8" – 16NC x 1"	8
10	FS540900	WASHER, lock – 3/8"	8
11	097-0458	CABLE, winch – 1/2" – (includes items 12 thru 14) (for 12,000 lb. winch).....	1
	097-0459	CABLE, winch – 7/16" – (includes items 12 thru 14) (for 8,000 lb. winch).....	1
12	097-0458-001	SLEEVE – (for 12,000 lb. winch)	1
	097-0459-001	SLEEVE – (for 8,000 lb. winch)	1
13	035-2072	THIMBLE – 1/2" – (for 12,000 lb. winch)	1
	035-1959	THIMBLE – 7/16" – (for 8,000 lb. winch)	1
14	053-1964	HOOK – with safety latch	1
15	211-4322	BRACKET, rear light	1
16	211-5884	GUARD, center stop light (not shown)	1

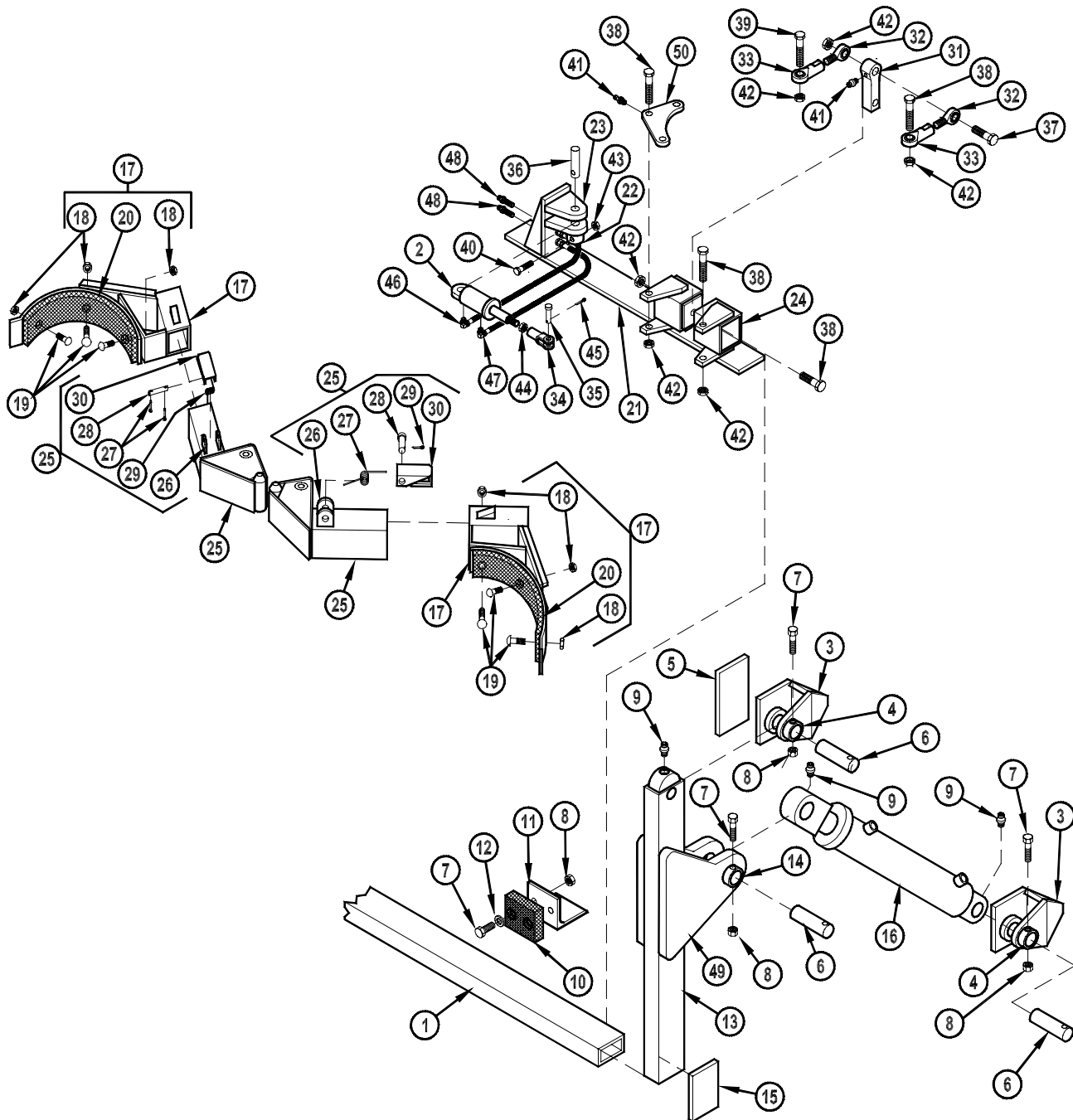
REEVING MECHANISM for



REEVING MECHANISM for

REF	PART NO.	DESCRIPTION	REQ'D
1	072-1555	SHEAVE – 6" X 7/8" bore	2
2	048-5537	PIN	3
3	FS190700	FITTING, grease – 1/4" NPT – 28	6
4	FS070826	CAPSCREW – 5/16" – 18NC x 1-3/4"	3
5	097-0469-054	CABLE & HOOK ASSEMBLY – (includes 28 & 31)	1
6	097-0465	CLAMP, cable	3
7	097-0453-003	THIMBLE	1
8	072-1556	SHEAVE – 8" x 1-1/2" bore	1
9	211-3134	PIN ASSEMBLY	1
10	FS070913	CAPSCREW – 3/8" – 16NC x 5/8"	1
11	FS540900	WASHER, lock – 3/8"	1
12	072-1558	SHEAVE – 2-1/2" x 7/8" bore	1
13	211-6954	BRACKET	1
14	048-5269	PIN	1
15	211-4229	BRACKET – (right hand)	1
16	211-4230	BRACKET – (left hand)	1
17	072-1557	SHEAVE – 8" x 1-3/4" bore	2
18	FS070934	CAPSCREW – 3/8" – 16NC x 2-1/2"	2
19	FS230900	NUT, lock – 3/8" - 16NC	2
20	048-5403	PIN	1
21	FS340740	PIN, cotter – 1/4" x 3-1/2"	2
22	064-3033	GUIDE	1
23	015-2612	SPACER	1
24	FS230800	NUT, lock – 5/16" – 18NC	3
25	211-4319	BRACKET	1
26	211-4223	BRACKET – weldment – part of 211-4345)	1
27	097-0469-003	THIMBLE	1
28	053-1963	HOOK, swivel	1

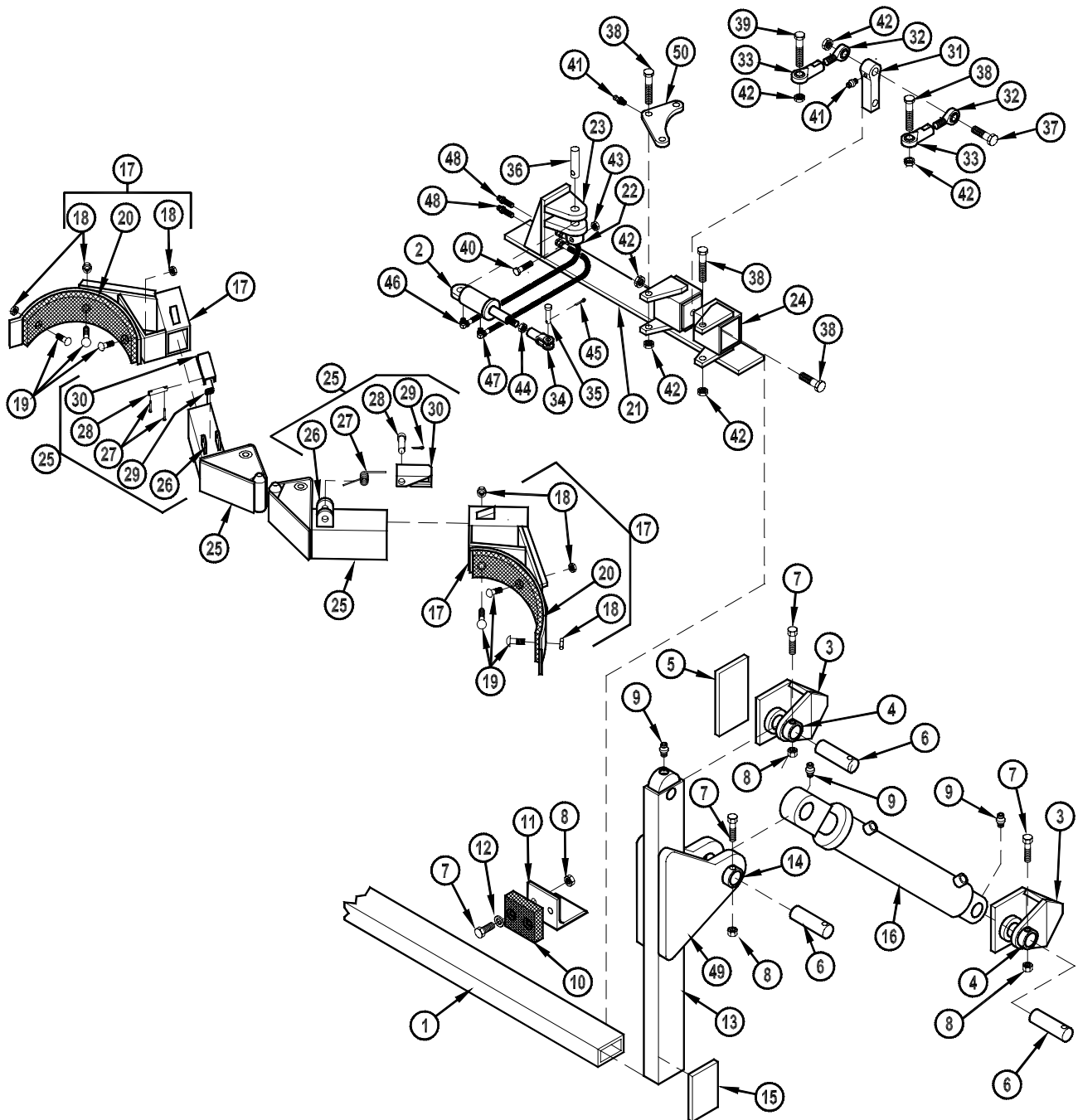
ROLL-BAR FLIPPER MECHANISM



ROLL-BAR FLIPPER MECHANISM

REF	PART NO.	DESCRIPTION	REQ'D
1	054-7877	TUBE, cross	1
2	REF.	CYLINDER, grabber – (See Section 5)	1
3	211-3292	BRACKET, cylinder – L.H.	2
	211-3293	BRACKET, cylinder – R.H.	2
4	040-2071	COLLAR, retaining	1
5	134-8281	PLATE, spacer	2
6	048-5371-044	PIN	6
7	FS100934	CAPSCREW – 3/8" – 24NFx2-1/2"	A/R
8	FS240900	NUT, lock – 3/8" – 24NF	A/R
9	FS190400	FITTING, grease – 1/8" x straight	6
10	014-1537	PAD	4
11	080-1294	STOP, pad	2
12	FS510900	WASHER, flat – 3/8"	4
13	093-2246-001	ARM, lift – weldment – L.H.	1
	093-2246-002	ARM, lift – weldment – R.H.	1
14	040-2071	COLLAR, retaining	1
15	207-5188	PLATE	1
16	REF.	CYLINDER, lift – (See Section 5)	1
17	093-2031	ARM ASSEMBLY, grabber	2
18	FS231100	NUT, lock – 1/2" – 13NC	3
19	FS021124	BOLT, carriage – 1/2" – 13NC x 1-1/2"	3
20	014-1711	LINER, rubber	1
21	211-7501	BRACKET, tipper	1
22	040-2218	COLLAR, lock	1
23	211-7502-003	BEARING	2
24	177-3442	SUPPORT, grabber arm – L.H.	1
	177-3443	SUPPORT, grabber arm – R.H.	1
25	093-2240	ARM, pivot – L.H.	1
	093-2241	ARM, pivot – R.H.	1
26	093-2240-006	BEARING	2
27	019-1265	SPRING, torsion	1
28	048-5947	PIN	1
29	FS340420	PIN, cotter – 1/8" x 1"	2
30	053-2094	HANDLE, latch	1
31	013-5196	LEVER ASSEMBLY	1
32	032-0998	BALL JOINT	2
33	032-0999	BALL JOINT	2
34	032-1563	YOKE, adjustable	1
35	032-3127-008	PIN, clevis	1
36	048-5482	PIN	1
37	FS071344	CAPSCREW – 5/8" – 11NC x 3-1/2"	2
38	FS071362	CAPSCREW – 5/8" – 13NC x 5-1/4"	3
39	FS071380	CAPSCREW – 5/8" – 11NC x 7"	1

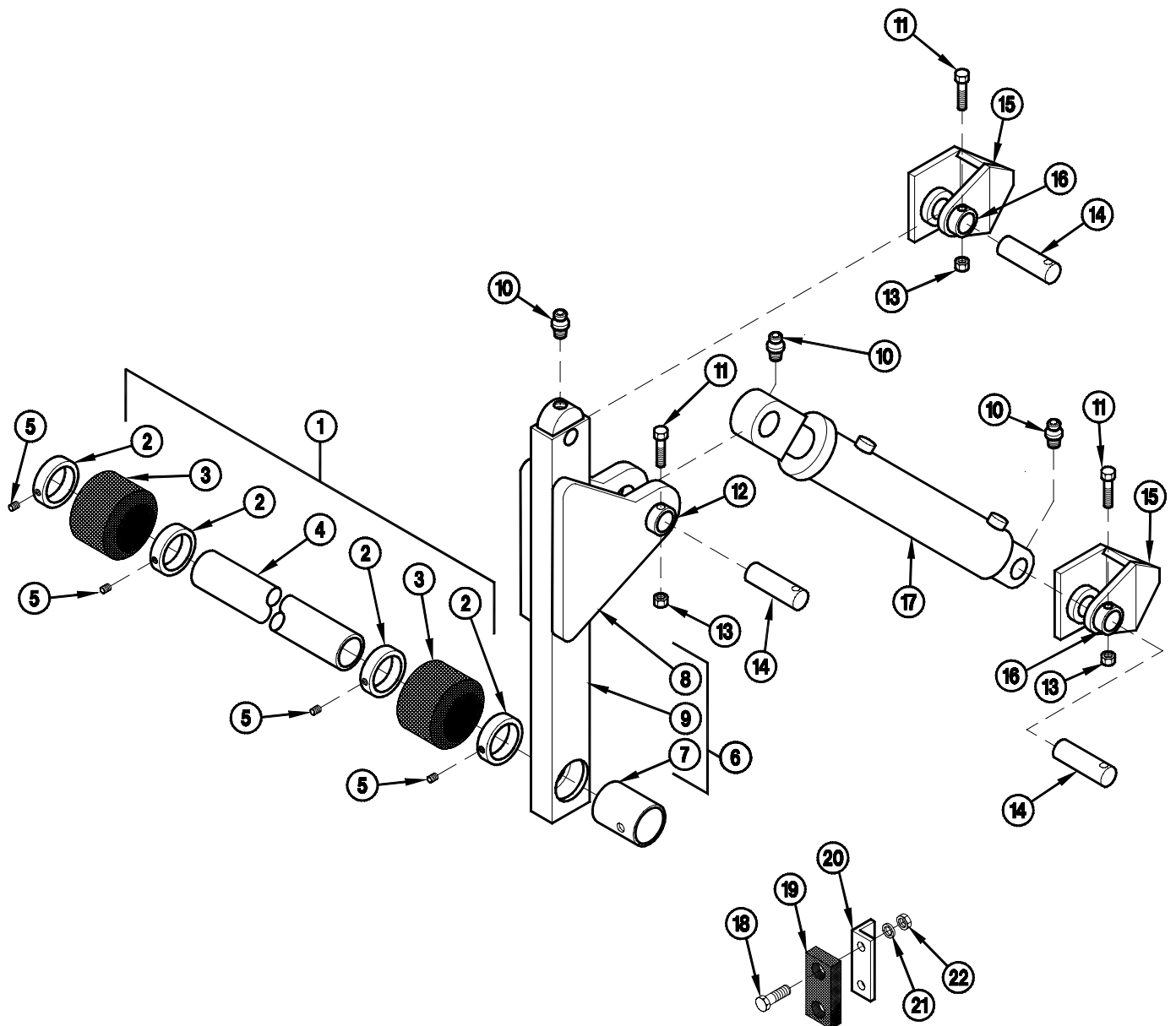
ROLL-BAR FLIPPER MECHANISM



ROLL-BAR FLIPPER MECHANISM

REF	PART NO.	DESCRIPTION	REQ'D
40	FS100930	CAPSCREW – 3/8" – 24NF x 2"	1
41	FS190700	FITTING, grease – 1/4" – 28 x straight	2
42	FS231300	NUT, lock – 5/8" – 11NC	6
43	FS240900	NUT, lock – 3/8" – 24NF	1
44	FS301500	NUT, jam – 3/4" – 16NC	1
45	FS340524	PIN, cotter – 5/32" x 1-1/2"	1
46	QC2-FEFE-19	HOSE, hydraulic	1
47	QC2-FEFE-24	HOSE, hydraulic	1
48	054-3535-05	UNION, bulkhead	2
49	207-5185	PLATE	2
50	013-5195	LEVER ASSEMBLY	1

ROLLER BAR MECHANISM with ROLLERS
272-7233



**ROLLER BAR MECHANISM with ROLLERS
272-7233**

REF	PART NO.	DESCRIPTION	REQ'D
1	354-0139	CROSSTUBE ASSEMBLY	1
2	003-4527	BEARING	4
3	003-4526	BEARING	1
4	354-0140	SHAFT, cross	1
5	047-1088	SETSCREW	4
6	093-2034	ARM, lift – left hand	1
	093-2035	ARM, lift – right hand	1
7	003-4525	BEARING	1
8	207-5185	PLATE	2
9	093-2326	ARM WELDMENT	1
10	FS190400	FITTING, grease – 1/8" NPT x straight	6
11	FS100934	CAPSCREW – 3/8" – 24NF x 2-3/4"	6
12	040-2071	COLLAR, retaining	2
13	FS240900	NUT, lock – 3/8" – 24NF	A/R
14	048-5371-044	PIN	6
15	211-3292	BRACKET, cylinder – left hand	2
	211-3293	BRACKET, cylinder – right hand	2
16	040-2071	COLLAR	2
17	REF.	CYLINDER, roll bar - (see section 5)	2
18	FS100926	CAPSCREW – 3/8" – 24NF x 1-3/4"	4
19	014-1415	PAD	2
20	211-5385	BRACKET, pad	2
21	FS510900	WASHER, flat – 3/8"	4
22	FS240900	NUT, lock – 3/8" – 24NF	10

SECTION 3

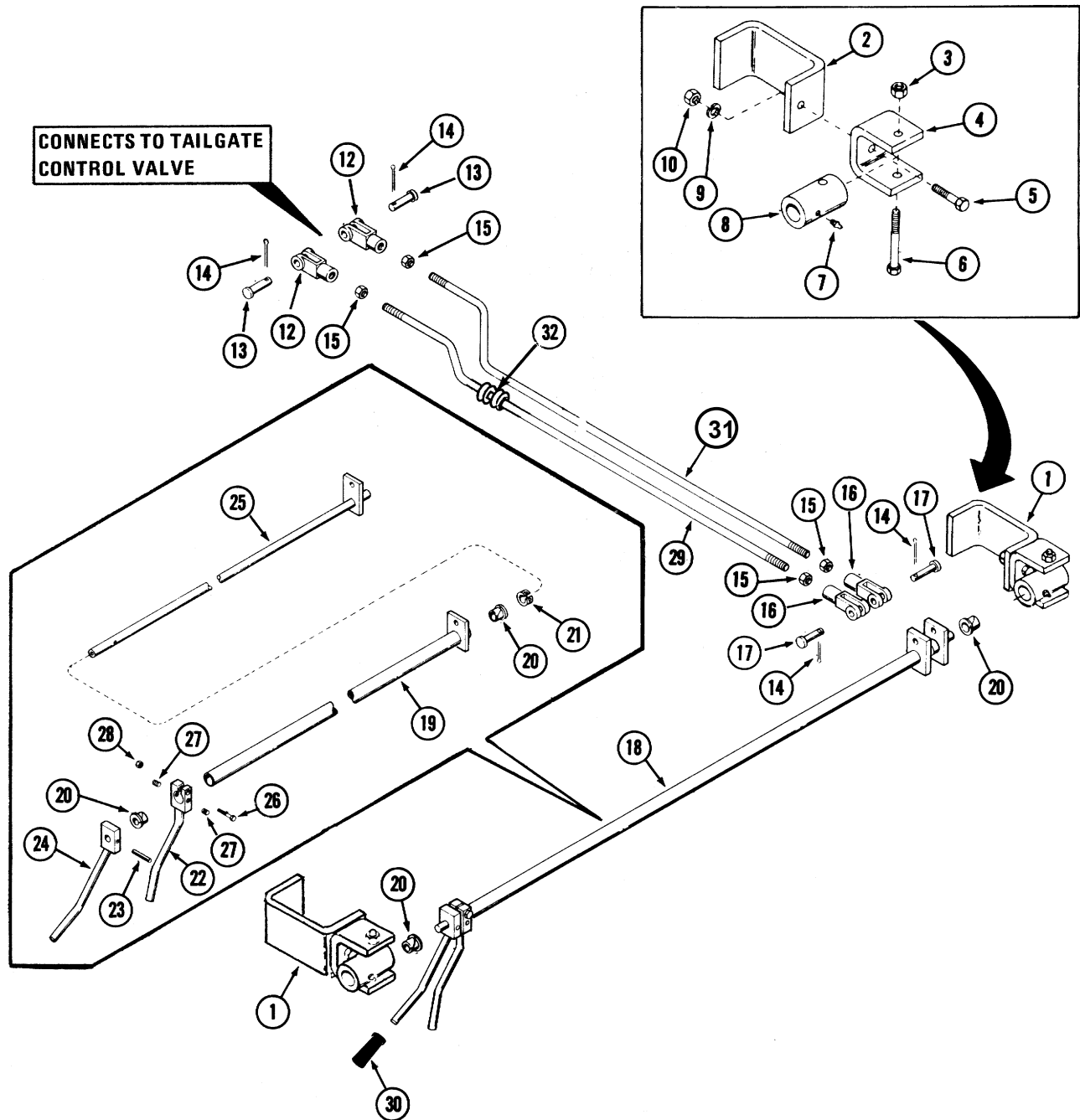
HYDRAULIC PUMPS SERVICE MANUAL



SECTION 3 – CONTROLS, THROTTLE ADVANCE AND NEUTRAL SWITCH KITS

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TAILGATE CONTROLS and LINKAGE

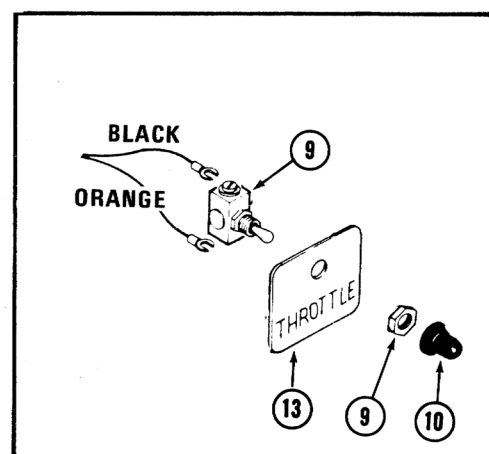
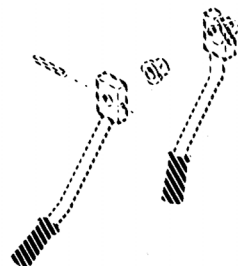
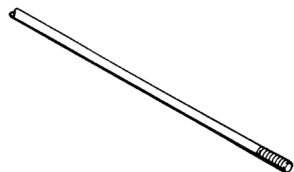
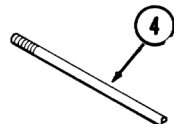
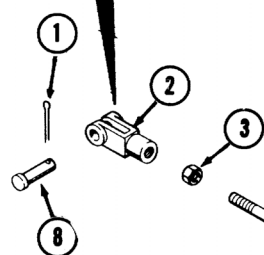


FORMULA 4000**TAILGATE CONTROLS and LINKAGE**

REF	PART NO.	DESCRIPTION	REQ'D
1	211-2648	BRACKET, control – (includes items 2 thru 10)	2
2	211-2649	BRACKET	1
3	FS240900	NUT, lock – 3/8" – 24NC	1
4	211-2650	BRACKET	1
5	FS070922	CAPSCREW – 3/8" – 24NC x 1-1/4"	1
6	FS090934	CAPSCREW – 3/8" – 24NC x 2-1/2"	1
7	230-0001	FITTING, grease – 1/8"NPT x 90°	1
8	211-2651	BOSS	1
9	FS540900	WASHER, lock – 3/8"	1
10	FS230900	NUT, lock – 3/8" – 16NC	1
12	032-0991	YOKE	2
13	048-3997	PIN, clevis	2
14	FS340212	PIN, cotter	4
15	FS301100	NUT, jam – 1/2" – 20NF	4
16	032-0009	YOKE	2
17	048-5581	PIN, clevis	2
18	027-3654	CONTROLS, mechanical – (includes items 19 thru 28)	1
19	027-3652	ROD, control	1
20	003-3567	BEARING	4
21	040-2058	COLLAR, lock	1
22	070-1194	HANDLE, control	1
23	048-3282-074	PIN, straight – coiled	1
24	070-1193	HANDLE, control	1
25	027-3651	ROD, control	1
26	FS100934	CAPSCREW – 3/8"-24NC x 2-1/2"	1
27	047-1749	SETSCREW	2
28	FS240900	NUT, nylock – 3/8" – 24NC	1
29	027-3656	ROD, control (96" wide units)	1
	027-4836	ROD, control (84" wide units)	1
30	070-1172	GRIP, handle	2
31	027-3655	ROD, control (96" wide units)	1
	027-4835	ROD, control (84" wide units)	1
32	207-2682	ACTUATOR, spool	1

SINGLE MECHANISM CONTROL and LINKAGE for WINCH, ROLL BAR, GRAB BAR OR ARM

**CONNECTS TO
TAILGATE VALVE.**



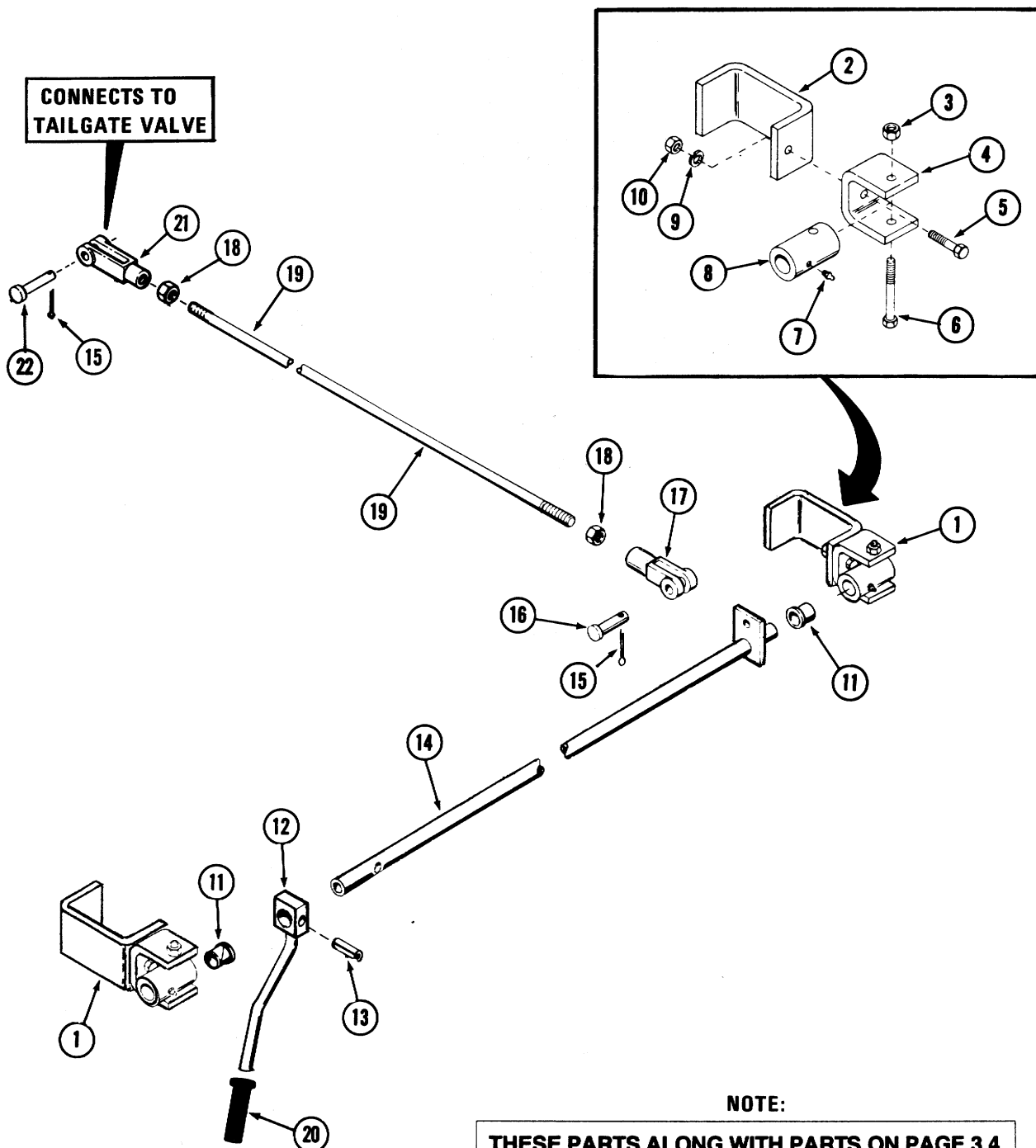
NOTE:

**PHANTOMED PARTS ARE
LOCATED PAGE 3.2.**

**SINGLE MECHANISM CONTROL and LINKAGE for
WINCH, ROLL BAR, GRAB BAR OR ARM**

REF	PART NO.	DESCRIPTION	REQ'D
1	FS340412	PIN, cotter – 3/32" x 3/4"	2
2	032-0991	YOKE.....	1
3	FS301100	NUT, jam – 1/2" –20NF	2
4	027-3656	ROD, control – (96" wide units).....	1
	027-4870	ROD, control – (84" wide units).....	1
5	032-0009	YOKE.....	1
6	003-3568	BEARING	2
7	048-5581	PIN, clevis.....	1
8	048-3997	PIN, clevis.....	1
9	108-2279	SWITCH, throttle.....	1
10	108-2280	BOOT	1
11	027-3653	ROD, control.....	1
12	070-0680	GRIP, handle	1

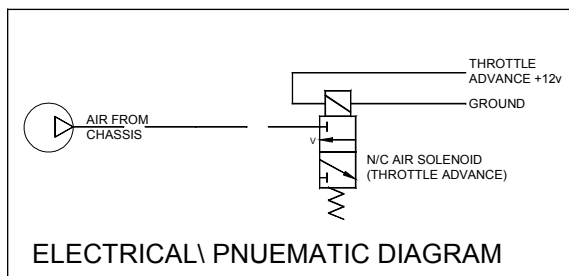
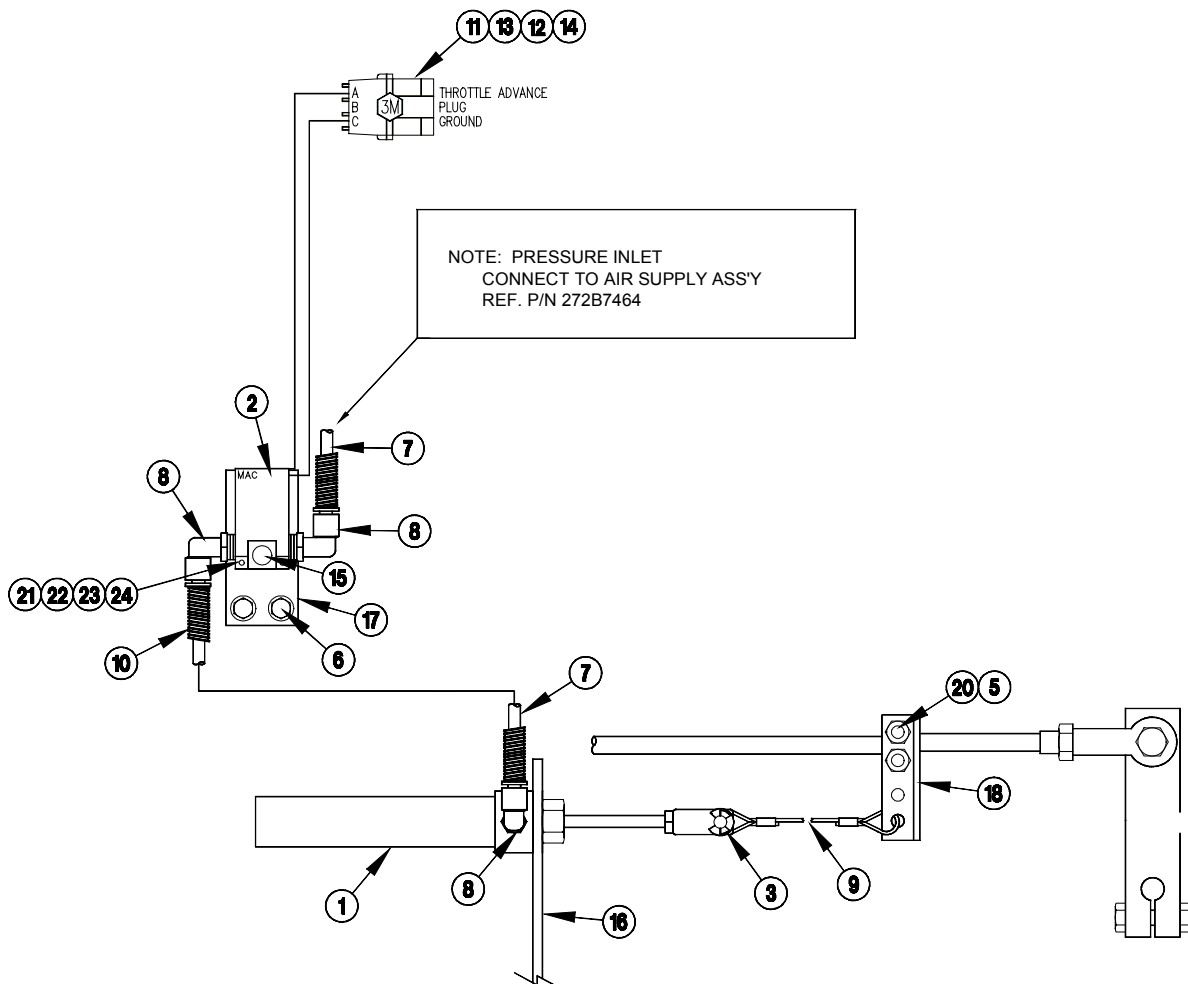
DOUBLE MECHANISM CONTROL and LINKAGE for WINCH, ROLL BAR, GRAB BAR OR ARM



**DOUBLE MECHANISM CONTROL and LINKAGE for
WINCH, ROLL BAR, GRAB BAR OR ARM**

REF	PART NO.	DESCRIPTION	REQ'D
1	211-4316	BRACKET, control (includes items 2 thru 10)	2
2	211-2649	BRACKET	1
3	FS240900	NUT, lock – 3/8" -24NC	1
4	211-2650	BRACKET	1
5	FS070922	CAPSCREW – 3/8" – 24NC x 1-1/4"	1
6	FS090934	CAPSCREW – 3/8" – 24NC x 2-1/2"	1
7	230-0001	FITTING, grease – 1/8" NPT x 90°	1
8	211-2651	BOSS	1
9	FS540900	WASHER, lock – 3/8"	1
10	FS230900	NUT, lock – 3/8" – 16NC	1
11	003-3568	BEARING	2
12	070-1450	HANDLE, control	1
13	048-2271-012	PIN, roll	1
14	027-4725	ROD, control	2
15	FS340212	PIN, cotter – 3/32" x 3/4"	2
16	048-5581	PIN, clevis	1
17	032-0009	YOKE	1
18	FS301100	NUT, jam – 1/2" -20NF	2
19	027-4723	ROD, control (96" wide units)	1
	027-4930	ROD, control (84" wide units)	1
20	032-0991	YOKE	1
21	032-0991	PIN, clevis	1

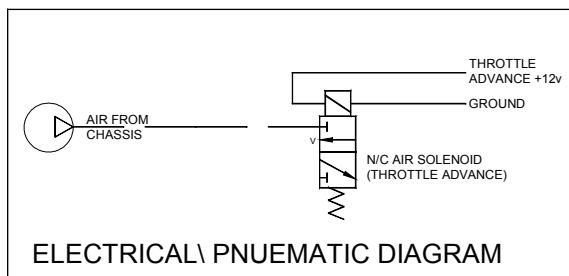
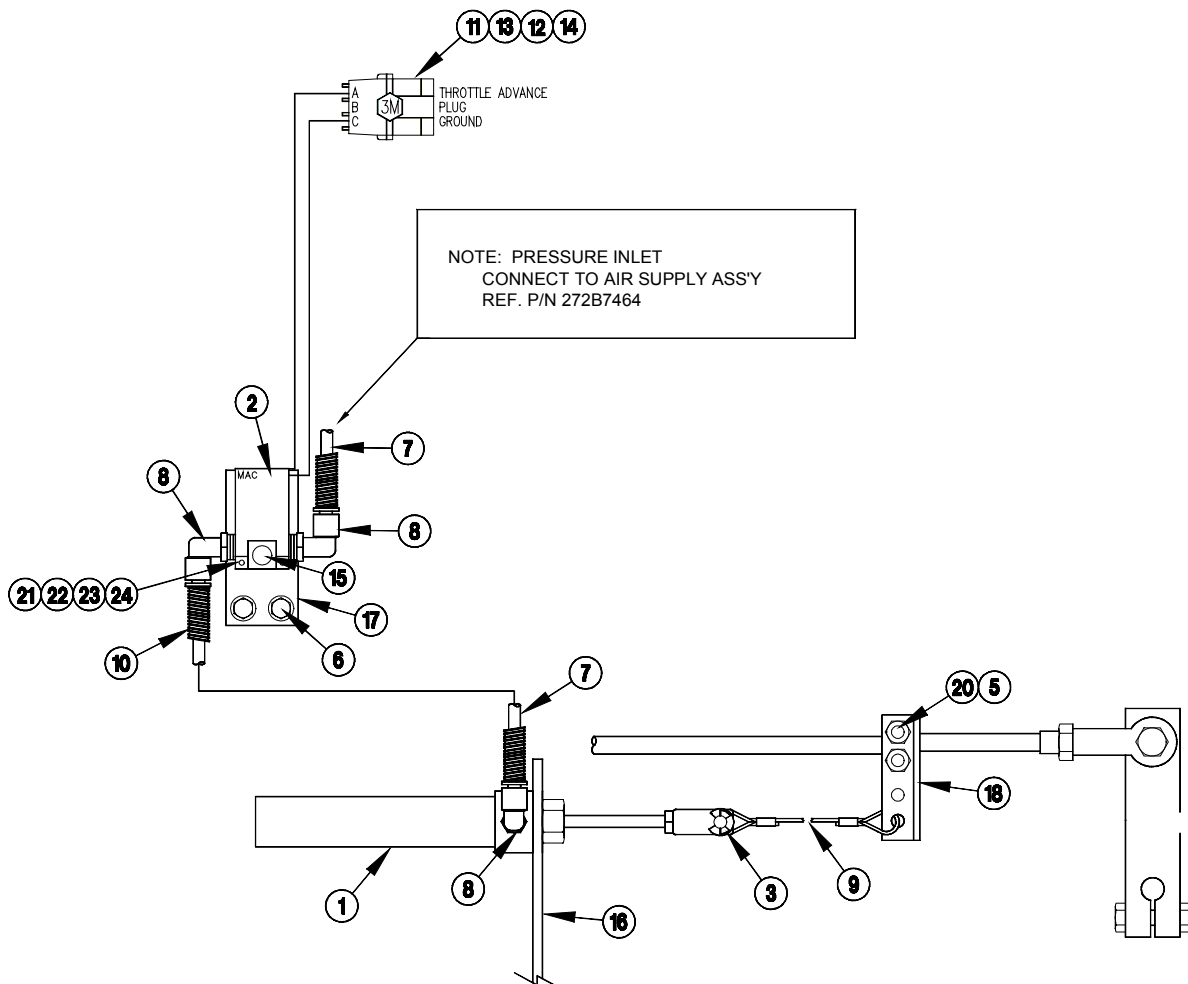
MECHANICAL ACTUATED THROTTLE ADVANCE for 12v DC CHASSIS 272-1818-001



**MECHANICAL ACTUATED THROTTLE ADVANCE for
12v DC CHASSIS
272-1818-001**

REF	PART NO.	DESCRIPTION	REQ'D
1	001-6374	CYLINDER, air	1
2	031-5724-012	VALVE, air solenoid – 12v	1
3	032-0968	YOKE	1
4	036-1115	CLAMP, strap	20
5	036-1714	"U" BOLT – 1/4"	1
6	047-2151-011	SCREW, tek	2
7	054-5449	LINE, air – 1/4"	15ft
8	054-8470-003	ELBOW, 90° tube – 1/8" NPT	3
9	097-0376	CABLE, throttle	1
10	108-4498	LOOM, electrical	15ft
11	108-4827-005	PLUG, 3-way	1
12	108-4827-130	SEAL, cable	2
13	108-4827-110	TERMINAL, male	2
14	108-4827-133	PLUG, cavity	1
15	108-5354-006	VENT, breather	1
16	111-8370	BRACKET, cylinder	1
17	211-5744	BRACKET, throttle solenoid	1
18	211-9848	BRACKET, throttle linkage	1
20	FS230700	NUT, lock – 1/4" – 20NC	2
21	FS270300	NUT - #8 – 32	2
22	FS420320	SCREW, machine - #8-32 x 1-1/2"	2
23	FS510300	WASHER, flat - #8	2
24	FS550300	WASHER, lock - #8	2

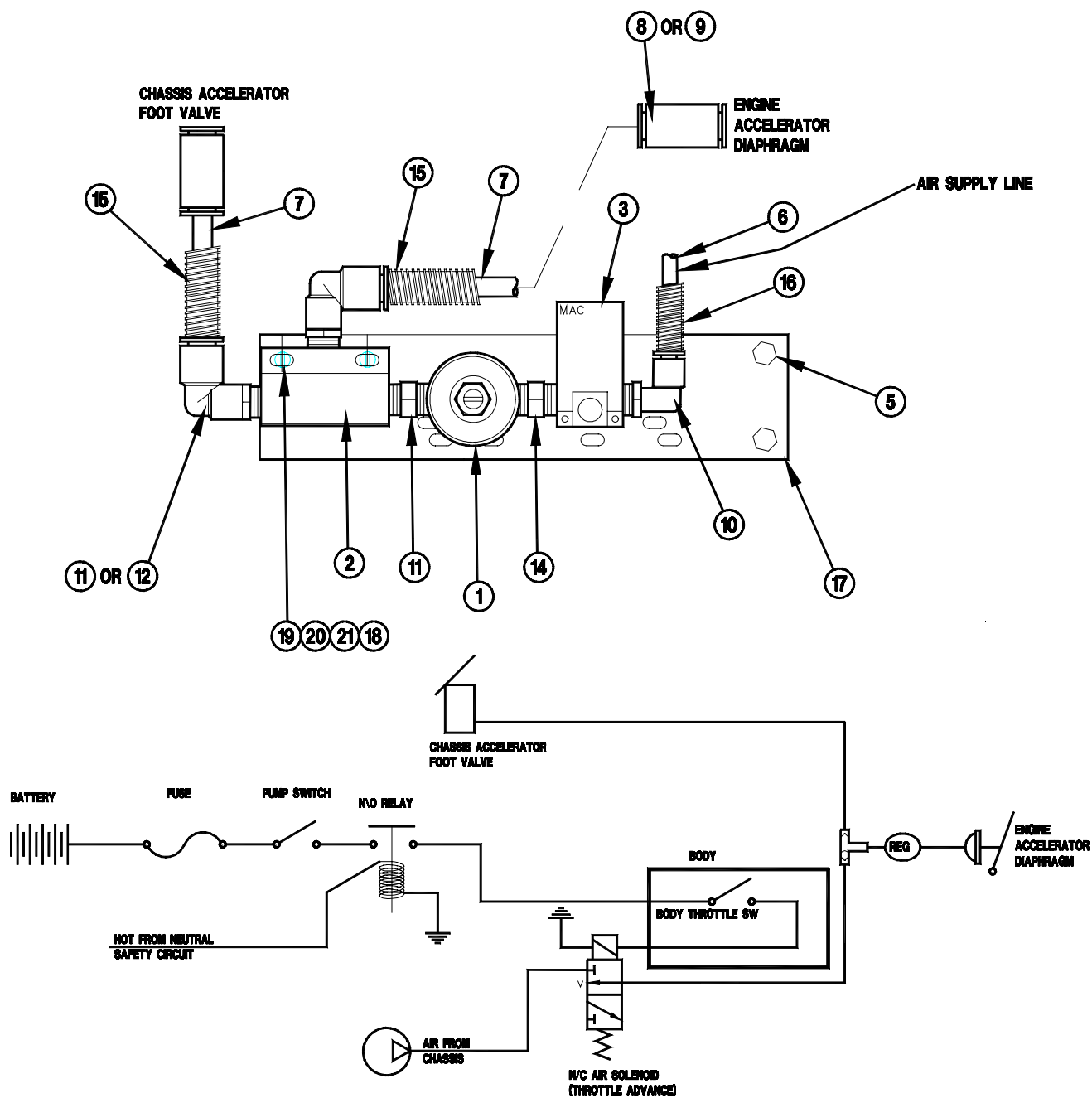
MECHANICAL ACTUATED THROTTLE ADVANCE for 12v DC CHASSIS 272-1818-01



**MECHANICAL ACTUATED THROTTLE ADVANCE for
12v DC CHASSIS
272-1818-01**

REF	PART NO.	DESCRIPTION	REQ'D
1	001-6374	CYLINDER, air	1
2	31-5724-012	VALVE, air solenoid – 12v	1
3	032-0968	YOKE	1
4	036-1115	CLAMP, strap	20
5	036-1714	“U” BOLT – 1/4”	1
6	047-2151-011	SCREW, tek	2
7	054-5449	LINE, air – 1/4”	15ft
8	054-8470-03	ELBOW, 90° tube – 1/8” NPT	3
9	097-0376	CABLE, throttle	1
10	108-4498	LOOM, electrical	15ft
11	108-4827-005	PLUG, 3-way	1
12	108-4827-130	SEAL, cable	2
13	108-4827-110	TERMINAL, male	2
14	108-4827-133	PLUG, cavity	1
15	108-5354-006	VENT, breather	1
16	111-8370	BRACKET, cylinder	1
17	211-5744	BRACKET, throttle solenoid	1
18	211-9848	BRACKET, throttle linkage	1
20	FS230700	NUT, lock – 1/4” – 20NC	2
21	FS270300	NUT - #8 – 32	2
22	FS420320	SCREW, machine - #8-32 x 1-1/2”	2
23	FS510300	WASHER, flat - #8	2
24	FS550300	WASHER, lock - #8	2

**MECHANICAL ACTUATED THROTTLE ADVANCE for
ENGINES with PNEUMATIC ACCELERATOR
272-1818-002**

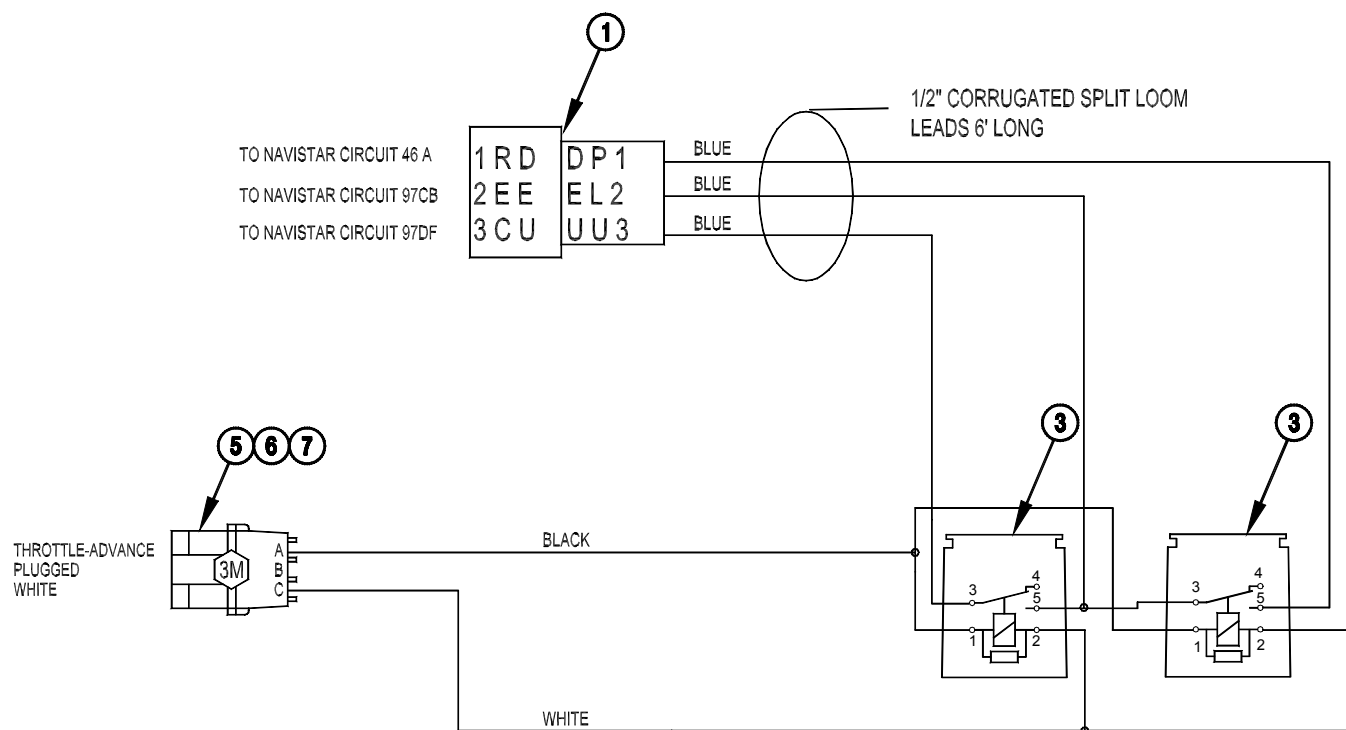


ELECTRICAL\ PNEUMATIC DIAGRAM

**MECHANICAL ACTUATED THROTTLE ADVANCE for
ENGINES with PNEUMATIC ACCELERATOR
272-1818-002**

REF	PART NO.	DESCRIPTION	REQ'D
1	031-3318	REGULATOR, air.....	1
2	031-3540	VALVE, shuttle	1
3	031-5724-012	VALVE, air solenoid	1
4	036-1115	TIE, plastic.....	30
5	047-2151-011	SCREW, tek – 1/4" – 14 x 1"	2
6	054-5449	LINE, air – 1/4" x 25ft	1
	054-7648	LINE, air – 3/8" x 10ft	1
7	054-8469-002	UNION, straight – 1/4"	2
	054-8469-004	UNION, straight – 3/8"	2
8	FS510300	WASHER, flat - #8	2
9	FS550300	WASHER, lock - #8.....	2
10	054-8470-003	ELBOW, 90° - 1/8" NPT	1
11	054-8470-004	ELBOW, 90° - 1/4" NPT	2
	054-8470-006	ELBOW, 90° - 3/8"	2
12	FS420322	SCREW, machine - #8 – 32 x 1-1/2"	2
13	054-8927-002	NIPPLE – 1/4" NPT	1
14	054-8927-003	NIPPLE – 1/8" x 1/4"	1
15	108-4476	LOOM – 1/2" x 10ft.....	1
16	108-4498	LOOM – 11/32" x 25FT	1
17	108-4827-005	PLUG, 3-way	1
18	108-4827-011	TERMINAL, male	2
19	108-4827-013	SEAL, cable	2
20	108-5354-06	VENT, breather	1
21	211-9403	BRCKET	1
22	FS270300	NUT - #8 – 32	2

THROTTLE ADVANCE for ELECTRONIC CONTROLLED NAVISTAR ENGINE 272-1818-120

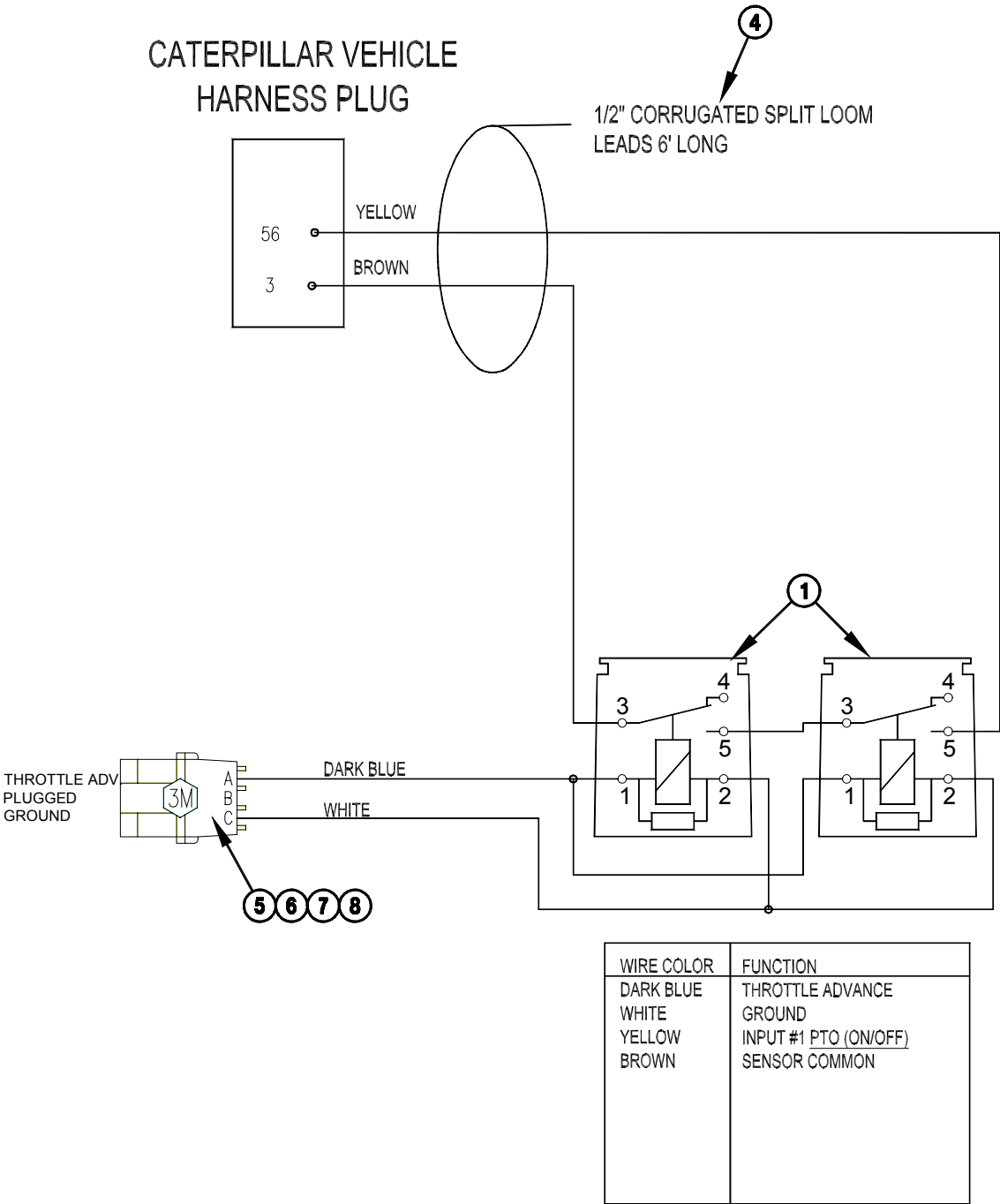


FORMULA 4000

THROTTLE ADVANCE for ELECTRONIC CONTROLLED NAVISTAR ENGINE 272-1818-120

REF	PART NO.	DESCRIPTION	REQ'D
1	108-6461-002	PLUG with hardware	1
2	036-1581	TIE, plastic.....	10
3	069-0032	KIT, micro relay (see section 6)	1
4	108-4476	LOOM, electrical	8ft
5	108-4827-005	CONNECTOR, 3-wkay male	1
6	108-4827-111	TERMINAL, male	2
7	108-4827-131	SEAL, cable.....	2
8	108-4827-133	PLUG, cavity (not shown)	1
9	108-5233-015	WIRE – 16 GA – (blue)	18ft
10	108-5233-017	WIRE – 16 GA – (black)	1ft
11	108-5233-022	WIRE – 16 GA - (white)	1ft

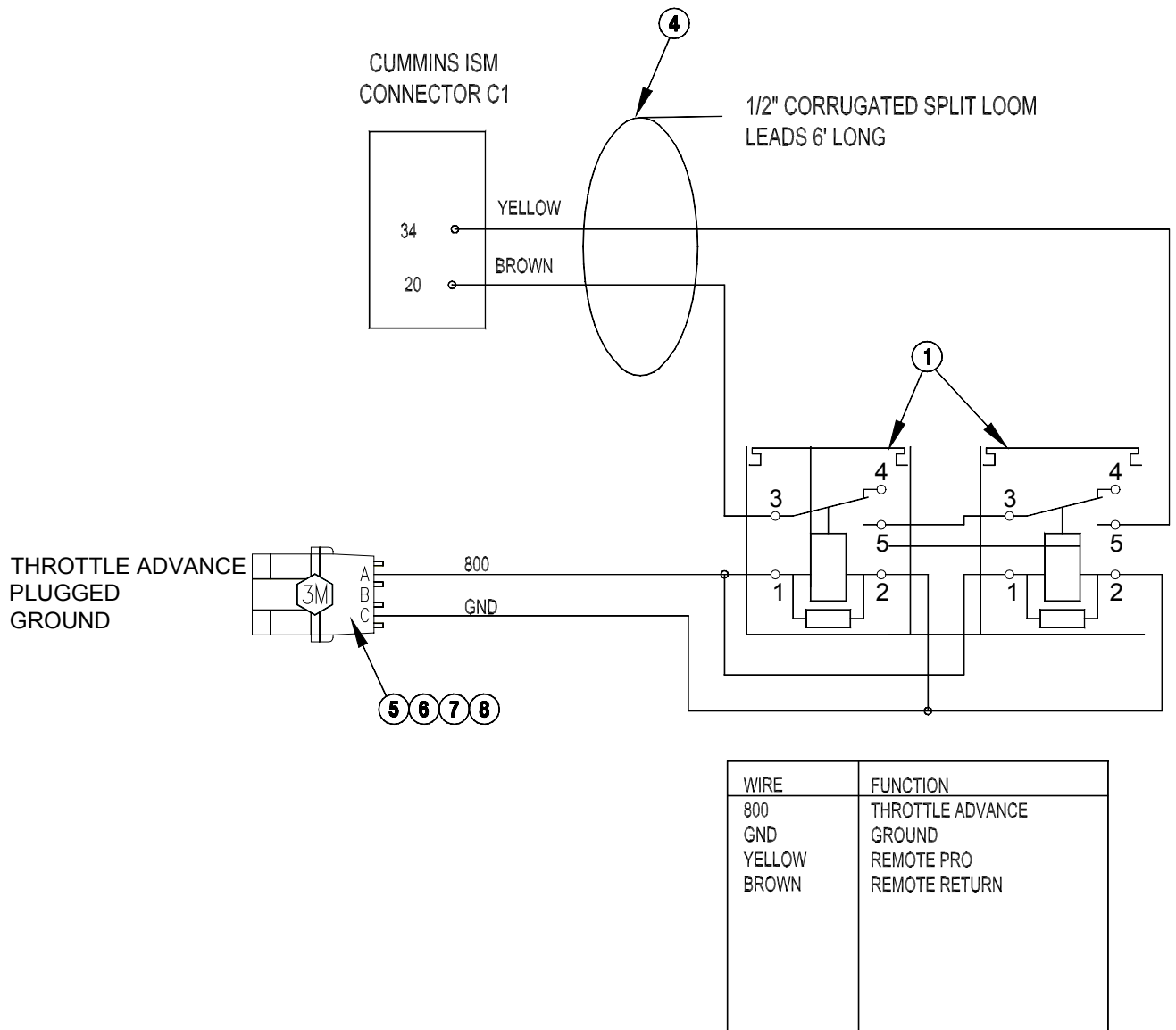
THROTTLE ADVANCE for ELECTRONIC CONTROLLED
CAT ENGINE
272-1818-121



**THROTTLE ADVANCE for ELECTRONIC CONTROLLED
CAT ENGINE
272-1818-121**

REF	PART NO.	DESCRIPTION	REQ'D
1	069-0032	KIT, micro relay – (see section 6)	2
2	036-1581	TIE, plastic (not shown).....	10
3	047-2151-001	TEK SCREW (not shown)	2
4	108-4476	LOOM, electrical.....	8ft
5	108-4827-05	CONNECTOR, 3-way male	1
6	108-4827-111	TERMINAL, male	2
7	108-4827-131	SEAL, cable.....	2
8	108-4827-133	PLUG, cavity.....	1
9	108-5233-015	WIRE – 16 GA (dark blue)	1ft
10	108-5233-021	WIRE – 16 GA (brown)	8ft
11	108-5233-022	WIRE – 16 GA (white).....	2ft
12	108-5233-024	WIRE – 16 GA (yellow)	8ft

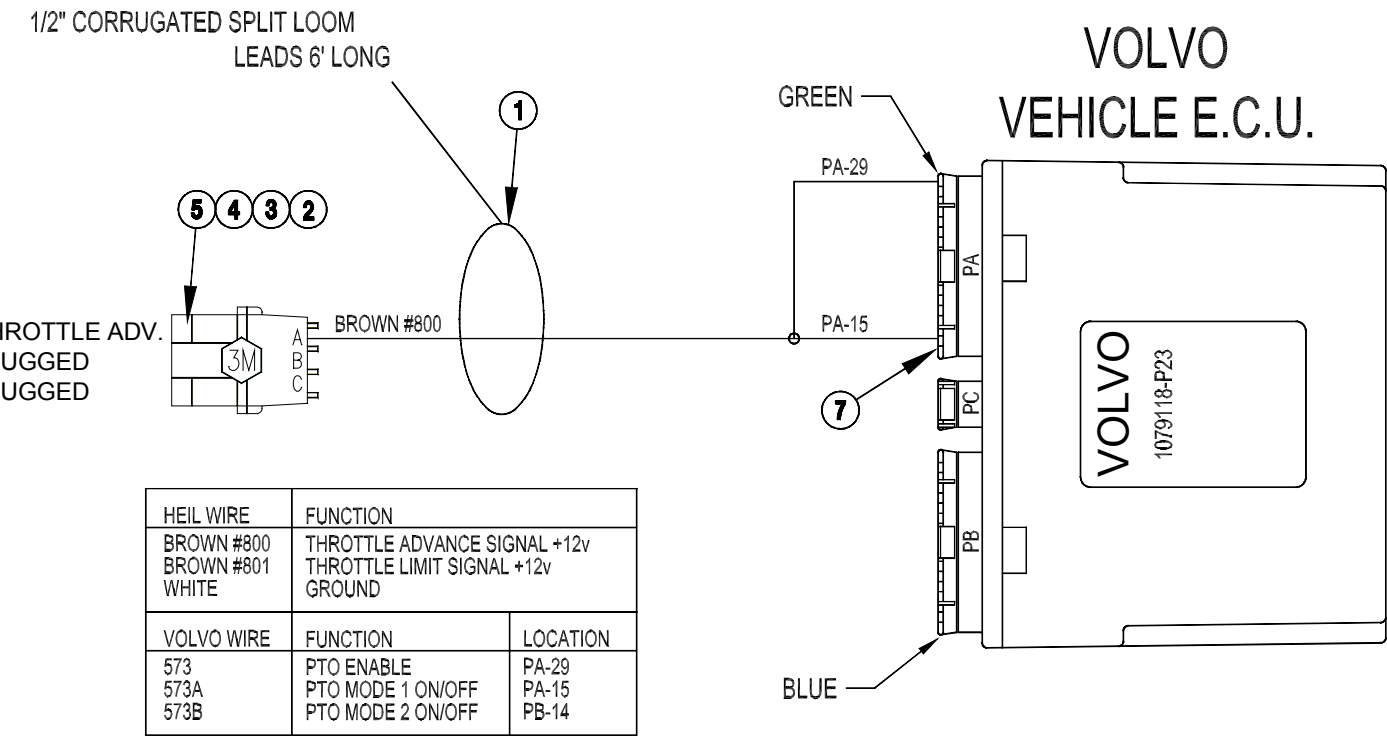
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**THROTTLE ADVANCE for ELECTRONIC CONTROLLED
CUMMINS ISM ENGINE
272-1818-122**

REF	PART NO.	DESCRIPTION	REQ'D
1	069-0032	KIT, micro relay – (see section 6)	1
2	036-1581	TIE, plastic (not shown).....	10
3	047-2151-001	TEK SCREW (not shown)	2
4	108-4476	LOOM, electrical.....	8ft
5	108-4827-05	CONNECTOR, 3-way male	1
6	108-4827-111	TERMINAL, male	2
7	108-4827-131	SEAL, cable.....	2
8	108-4827-133	PLUG, cavity.....	1
9	108-5233-015	WIRE – 16 GA (dark blue).....	1ft
10	108-5233-21	WIRE – 16 GA (brown)	8ft
11	108-5233-22	WIRE – 16 GA (white).....	2ft
12	108-5233-24	WIRE – 16 GA (yellow)	8ft

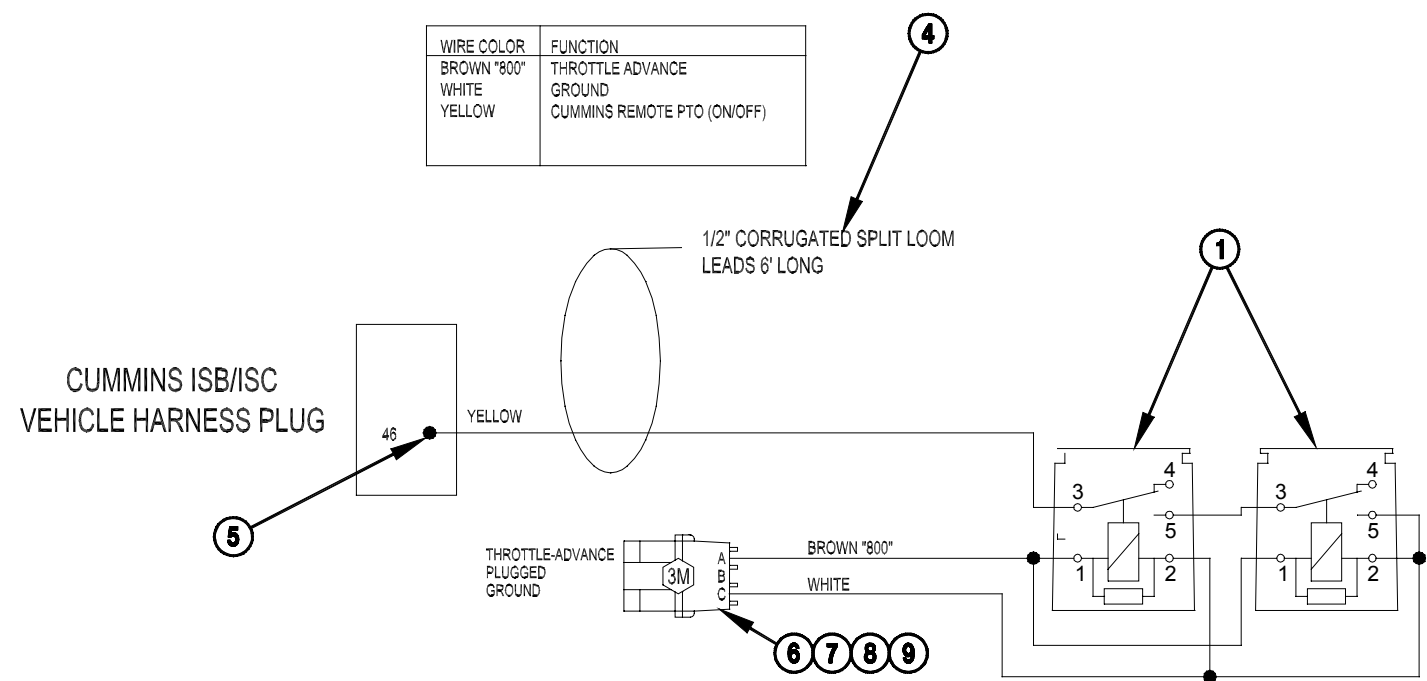
THROTTLE ADVANCE for ELECTRONIC CONTROLLED
VOLVO ENGINE
272-1818-127



**THROTTLE ADVANCE for ELECTRONIC CONTROLLED
VOLVO ENGINE
272-1818-127**

REF	PART NO.	DESCRIPTION	REQ'D
1	108-4498	LOOM, electrical.....	6ft
2	108-4827-005	CONNECTOR, 3-way male	1
3	108-4827-111	TERMINAL, male	1
4	108-4827-131	SEAL, cable.....	1
5	108-4827-133	PLUG, cavity.....	2
6	108-6718-800	WIRE – 16 GA (brown 800)	6ft
7	108-7114-002	PIN, Volvo VECU	2

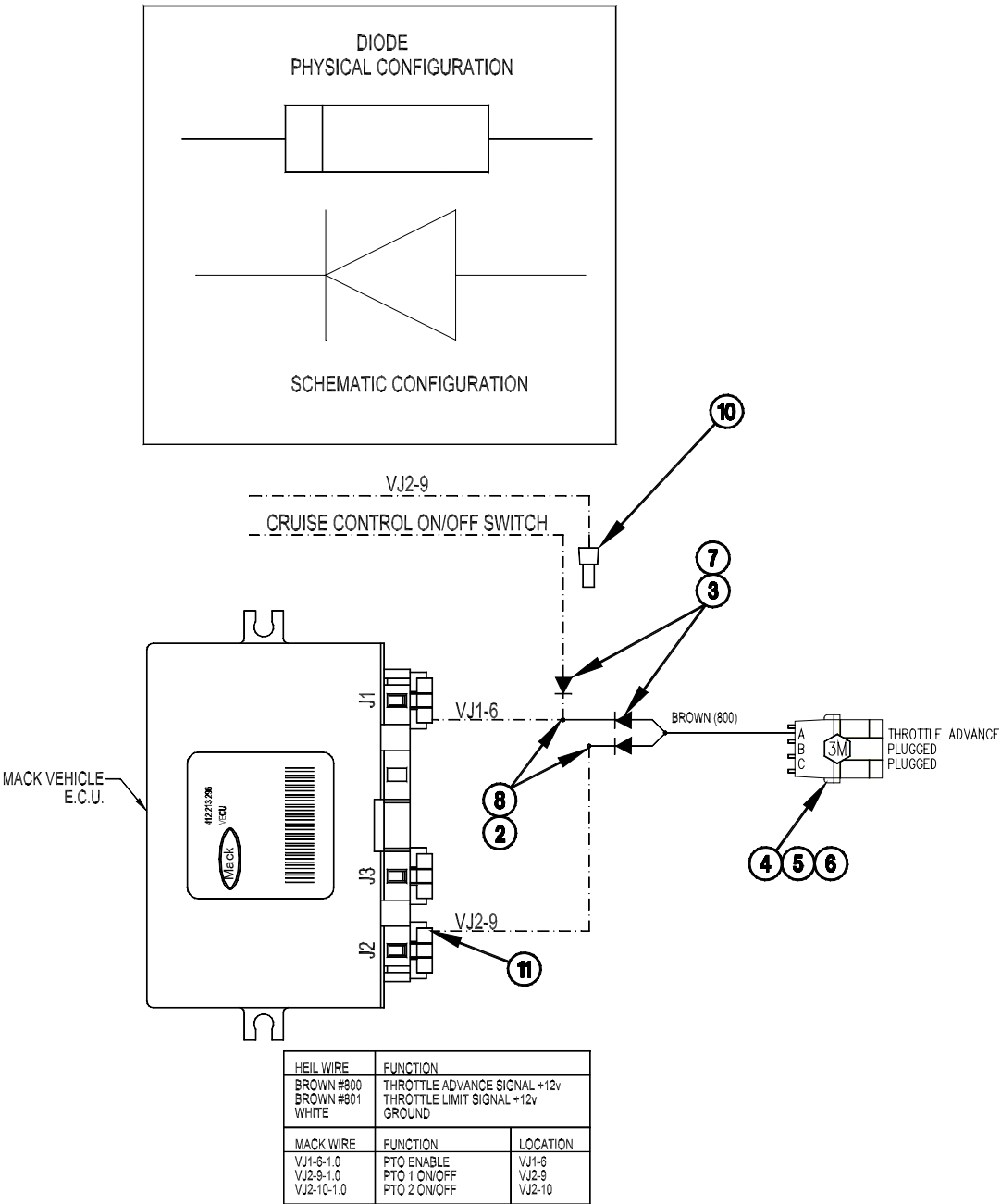
THROTTLE ADVANCE for ELECTRONIC CONTROLLED
CUMMINS ISB/ISC ENGINE
272-1818-128



**THROTTLE ADVANCE for ELECTRONIC CONTROLLED
CUMMINS ISB/ISC ENGINE
272-1818-128**

REF	PART NO.	DESCRIPTION	REQ'D
1	069-0032	KIT, micro relay – (see section 6)	1
2	036-1581	TIE, plastic (not shown).....	10
3	047-2151-001	TEK SCREW (not shown)	2
4	108-4476	LOOM, electrical.....	8ft
5	108-4815-113	SOCKET	1
6	108-4827-005	CONNECTOR, 3-way male	1
7	108-4827-111	TERMINAL, male	2
8	108-4827-131	SEAL, cable.....	2
9	108-4827-133	PLUG, cavity.....	1
10	108-5233-024	WIRE – 16 GA (yellow)	8ft
11	108-6761-800	WIRE – 16 GA (brown “800”)	1ft
12	108-6761-GND	WIRE – 16 GA (white “GND”).....	2ft

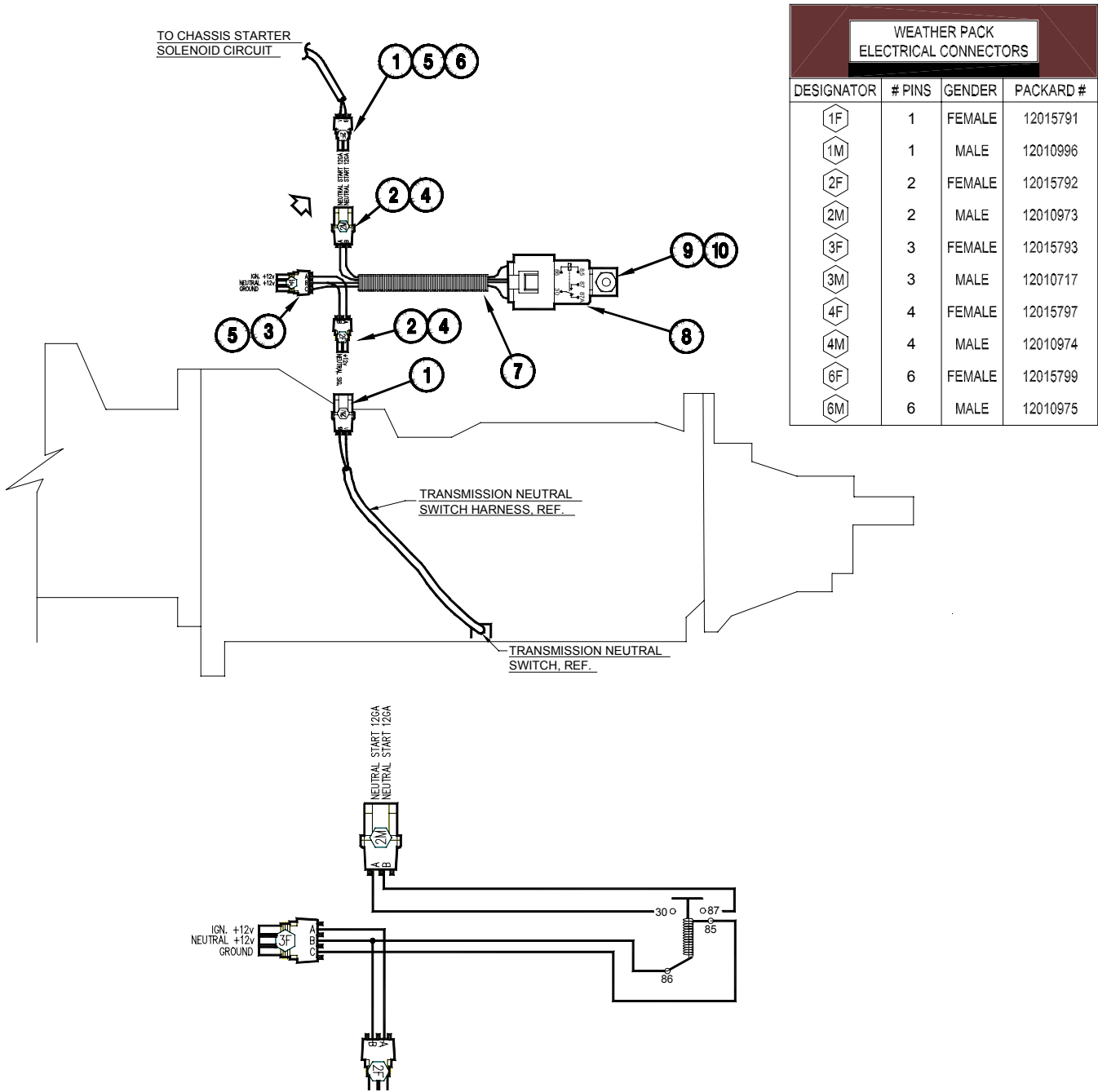
THROTTLE ADVANCE for ELECTRONIC CONTROLLED
Vmack ENGINES
272-1818-129



**THROTTLE ADVANCE for ELECTRONIC CONTROLLED
Vmack ENGINES
272-1818-129**

REF	PART NO.	DESCRIPTION	REQ'D
1	108-4827-133	PLUG, cavity.....	2
2	054-7350	TUBING, shrink.....	15"
3	108-2648	DIODE	3
4	108-4827-005	CONNECTOR, 3-way male	1
5	108-4827-111	TERMINAL, male	3
6	108-4827-131	SEAL, cable.....	1
7	108-5717-002	CONNECTOR, butt – 16-14	4
8	108-5717-003	CONNECTOR, butt – 12-10	6
9	108-6718-800	WIRE – 18 GA (brown "800")	3ft
10	108-3647	CONNECTOR, closed end	1
11	108-7114-03	PIN, Mack VECU.....	1

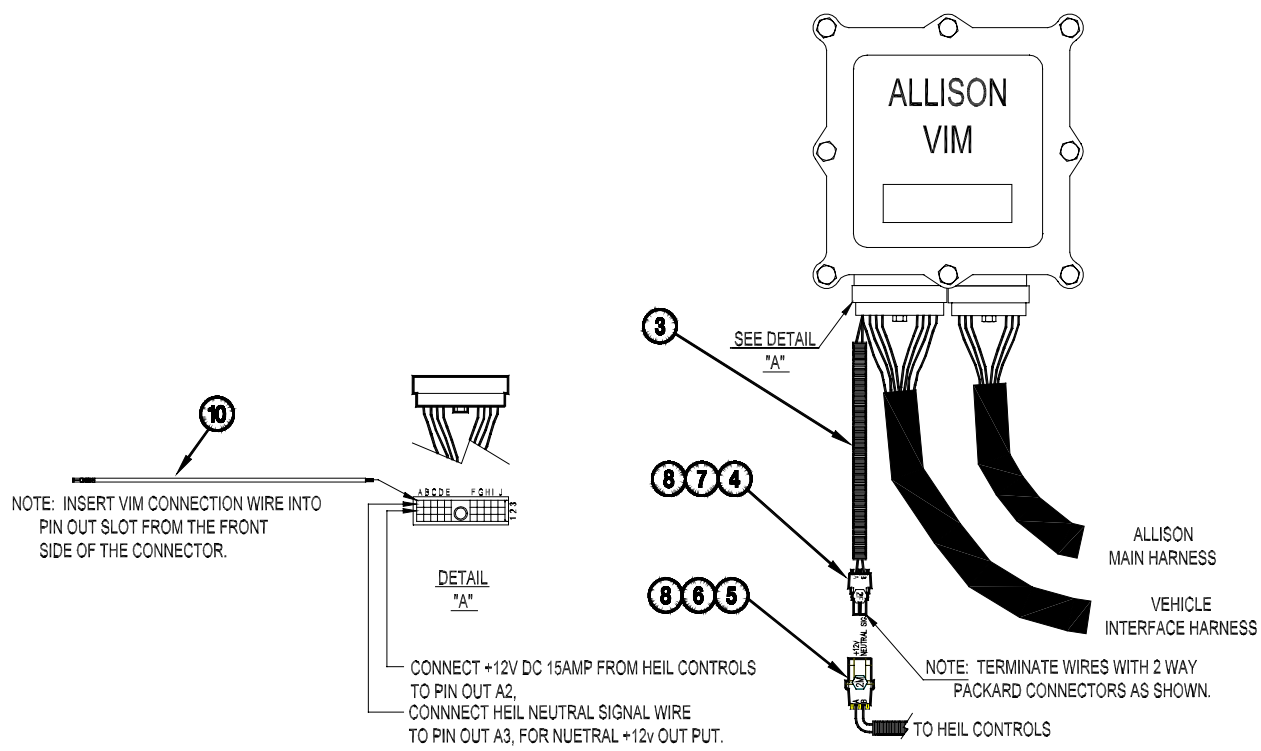
NEUTRAL SWITCH KIT for AUTOMATIC TRANSMISSION (NON-ELECTRONIC)
272-3183-001



**NEUTRAL SWITCH KIT for AUTOMATIC TRANSMISSION (NON-ELECTRONIC)
272-3183-001**

REF	PART NO.	DESCRIPTION	REQ'D
1	108-4827-004	PLUG, 2-way female	2
2	108-4827-003	PLUG, 2-way male	2
3	108-4827-006	PLUG, 3-way female	1
4	108-4827-011	TERMINAL, male	4
5	108-4827-012	TERMINAL, female	7
6	108-4827-013	SEAL, cable	11
7	108-4476	LOOM	1ft
8	108-6752	RELAY	1
9	FS070715	CAPSCREW – 1/4" – 20NC x 3/4"	1
10	FS230700	NUT, lock – 1/4" –20NC	1

NEUTRAL SWITCH KIT with ALLISON WORLD TRANSMISSION & ALLISON VIM
272-3183-002



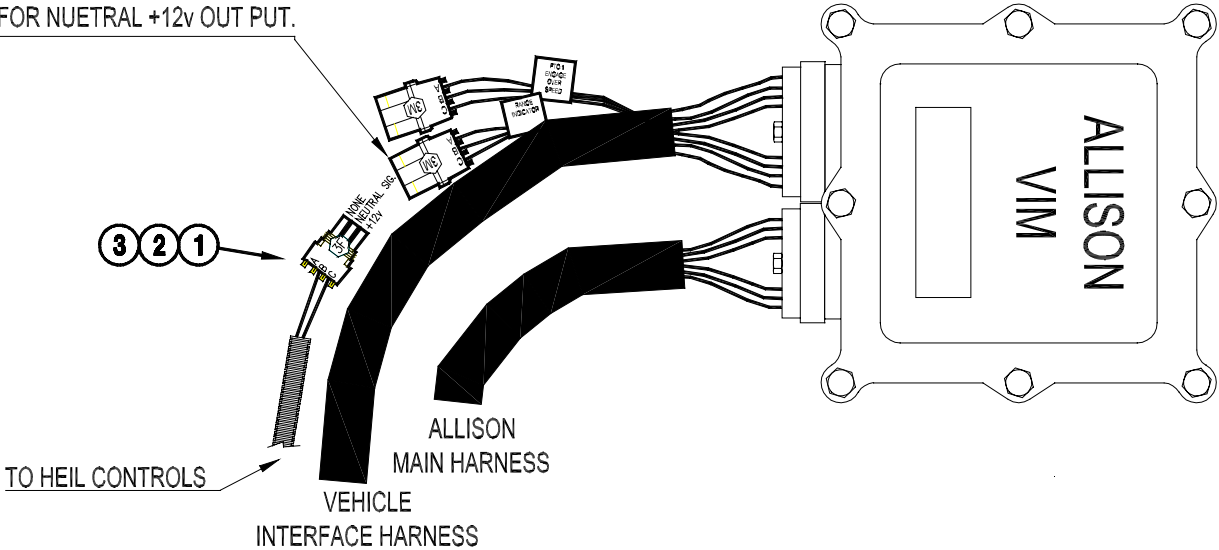
WEATHER PACK ELECTRICAL CONNECTORS			
DESIGNATOR	# PINS	GENDER	PACKARD #
1F	1	FEMALE	12015791
1M	1	MALE	12010996
2F	2	FEMALE	12015792
2M	2	MALE	12010973
3F	3	FEMALE	12015793
3M	3	MALE	12010717
4F	4	FEMALE	12015797
4M	4	MALE	12010974
6F	6	FEMALE	12015799
6M	6	MALE	12010975

**NEUTRAL SWITCH KIT with ALLISON WORLD TRANSMISSION & ALLISON VIM
272-3183-002**

REF	PART NO.	DESCRIPTION	REQ'D
1	036-1115	TIE, plastic.....	3
2	054-7350	TUBING, shrink	3"
3	108-4498	LOOM	1ft
4	108-4827-003	CONNECTOR, 2-way male	1
5	108-4827-004	CONNECTOR, 2-way female	1
6	108-4827-011	TERMINAL, male	2
7	108-4827-012	TERMINAL, female	2
8	108-4827-013	SEAL, cable.....	4
9	108-5717-002	CONNECTOR, butt.....	2
10	108-6362	WIRE, VIM connector	2

**NEUTRAL SWITCH KIT for 320 PETERBILT CHASSIS with
ALLISON WORLD TRANSMISSION
272-3183-003**

CONNECT +12V DC 15AMP FROM HEIL CONTROLS
TO PIN OUT C.
CONNECT HEIL NEUTRAL SIGNAL WIRE
TO PIN OUT B, FOR NUETRAL +12v OUT PUT.

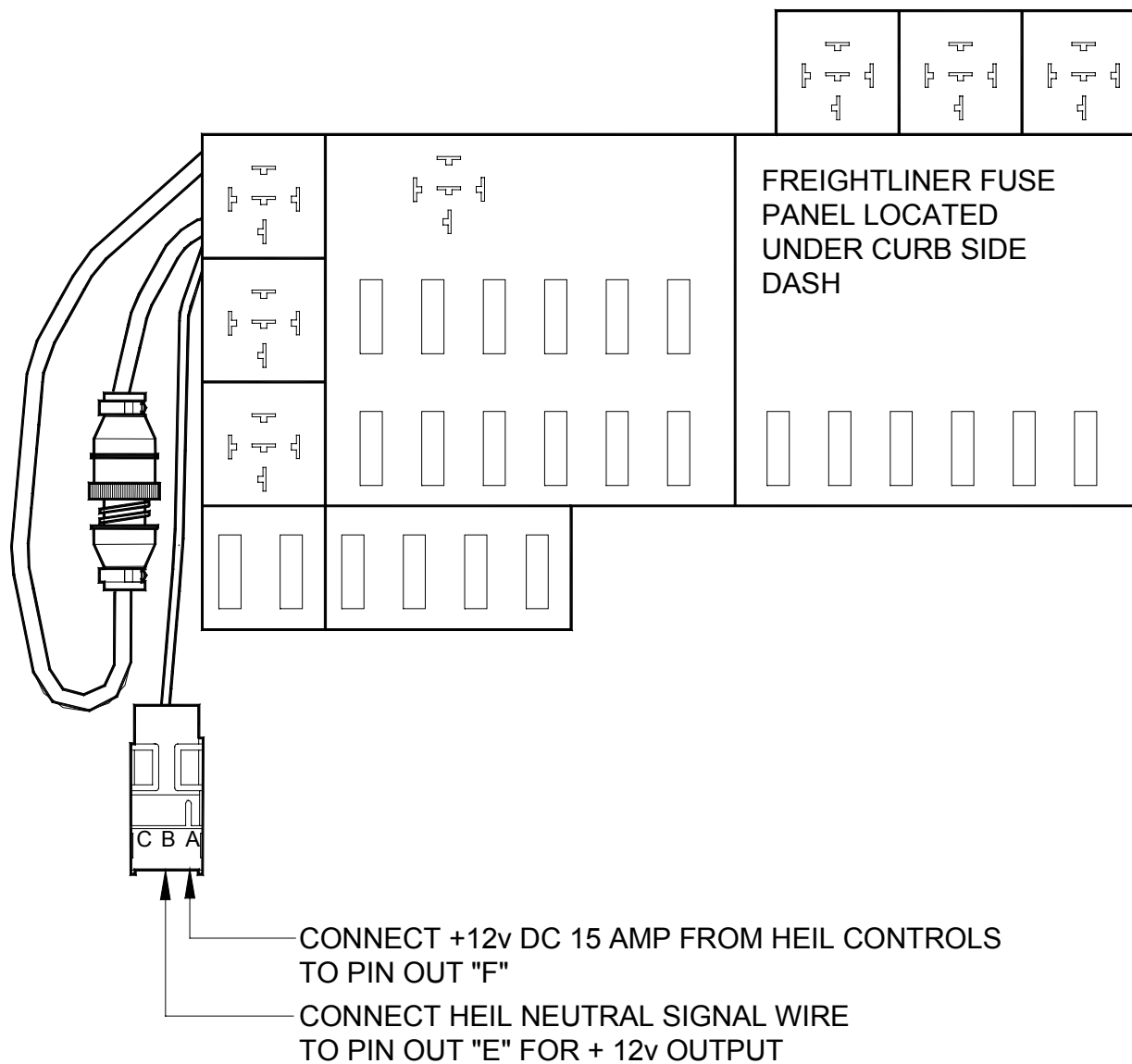


WEATHER PACK ELECTRICAL CONNECTORS			
DESIGNATOR	# PINS	GENDER	PACKARD #
1F	1	FEMALE	12015791
1M	1	MALE	12010996
2F	2	FEMALE	12015792
2M	2	MALE	12010973
3F	3	FEMALE	12015793
3M	3	MALE	12010717
4F	4	FEMALE	12015797
4M	4	MALE	12010974
6F	6	FEMALE	12015799
6M	6	MALE	12010975

**NEUTRAL SWITCH KIT for 320 PETERBILT CHASSIS with
ALLISON WORLD TRANSMISSION
272-3183-003**

REF	PART NO.	DESCRIPTION	REQ'D
1	108-4827-006	CONNECTOR, 3-way female	1
2	108-4827-012	TERMINAL, female	2
3	108-4827-013	SEAL, cable.....	2

**NEUTRAL SWITCH KIT for FREIGHTLINER CHASSIS
and ALLISON WORLD TRANSMISSION
272-3183-005**



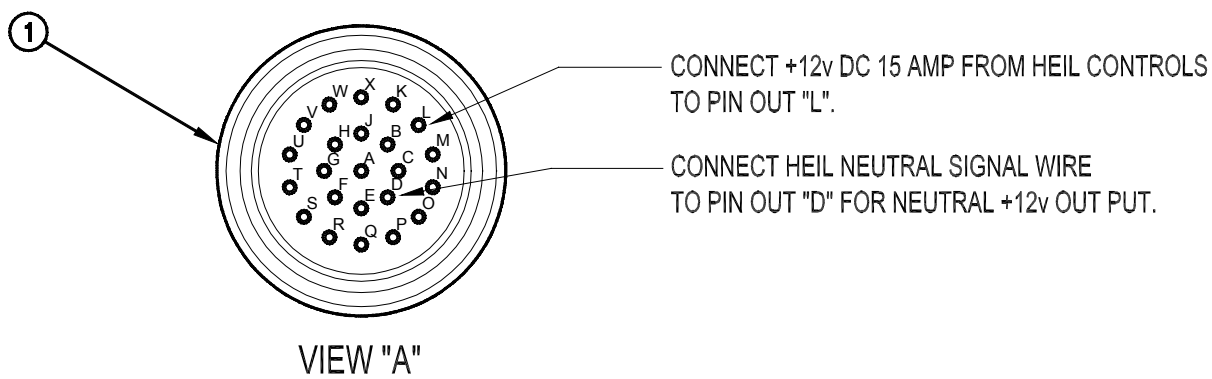
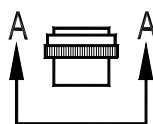
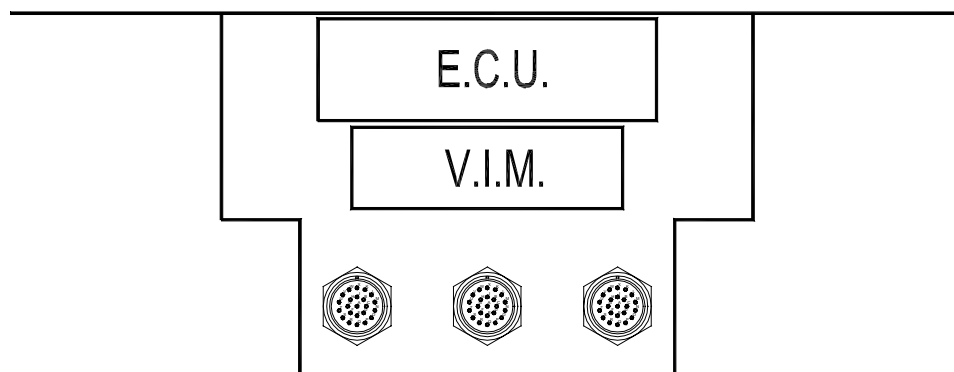
**NOTE: INSERT TERMINAL INTO
REAR OF CONNECTOR.**

**NEUTRAL SWITCH KIT for FREIGHTLINER CHASSIS
and ALLISON WORLD TRANSMISSION
272-3183-005**

REF	PART NO.	DESCRIPTION	REQ'D
1	108-6783	TERMINAL, packard	2

NEUTRAL SWITCH KIT for FORD LOUISVILLE
with ALLISON WORLD TRANSMISSION
272-3183-006

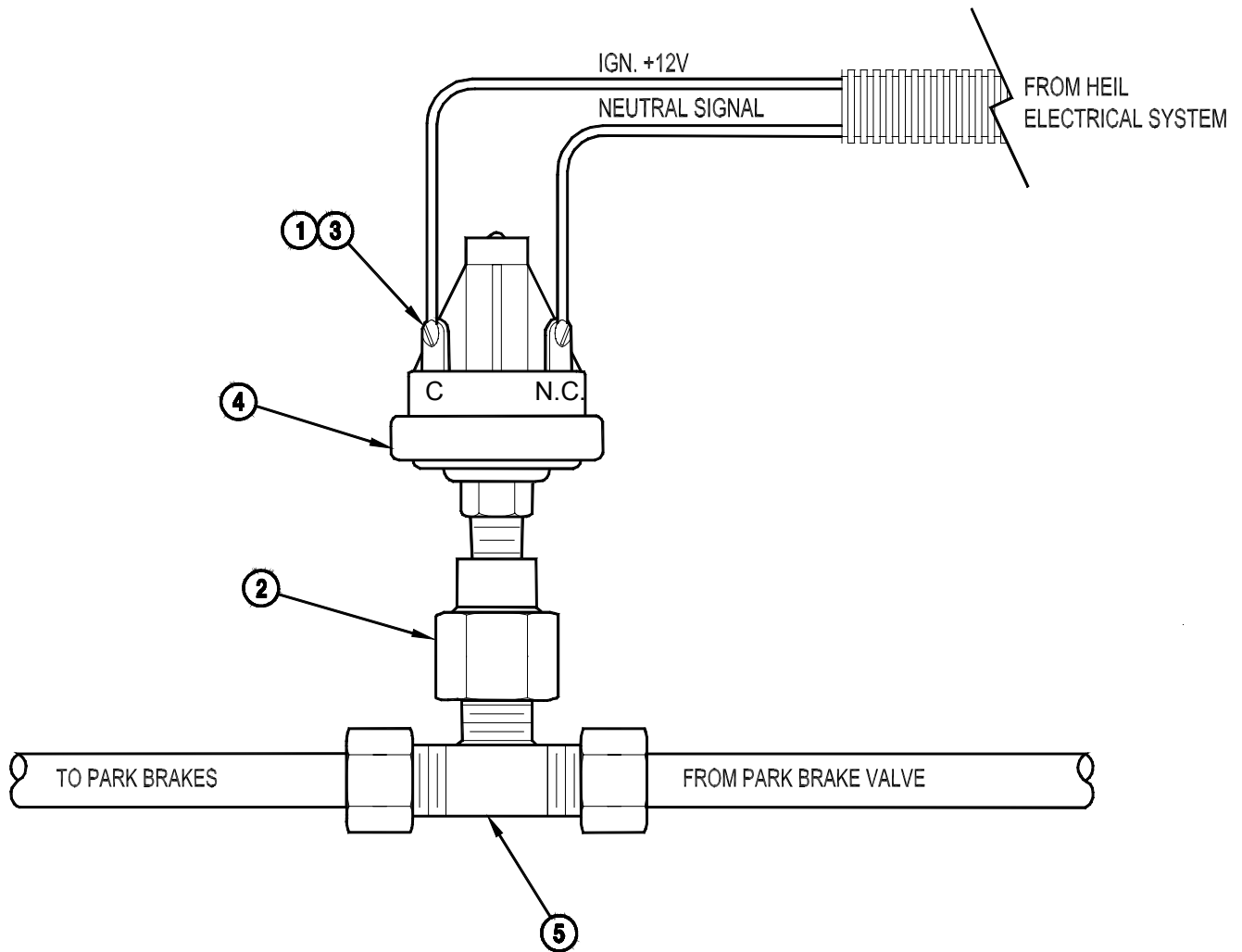
TRANSMISSION E.C.U. & V.I.M ARE LOCATED
 BENEATH FLOOR ATTACHED TO UNDER SIDE
 OF ACCESS PANEL OVER TRANSMISSION



**NEUTRAL SWITCH KIT for FORD LOUISVILLE
with ALLISON WORLD TRANSMISSION
272-3183-006**

REF	PART NO.	DESCRIPTION	REQ'D
1	108-6784	PLUG, deutsch	1
2	108-6031-012	SOCKET	2
3	108-6785-003	PLUG, sealing	21

NEUTRAL SWITCH KIT for MANUAL TRANSMISSION
272-3183-007



**NEUTRAL SWITCH KIT for MANUAL TRANSMISSION
272-3183-007**

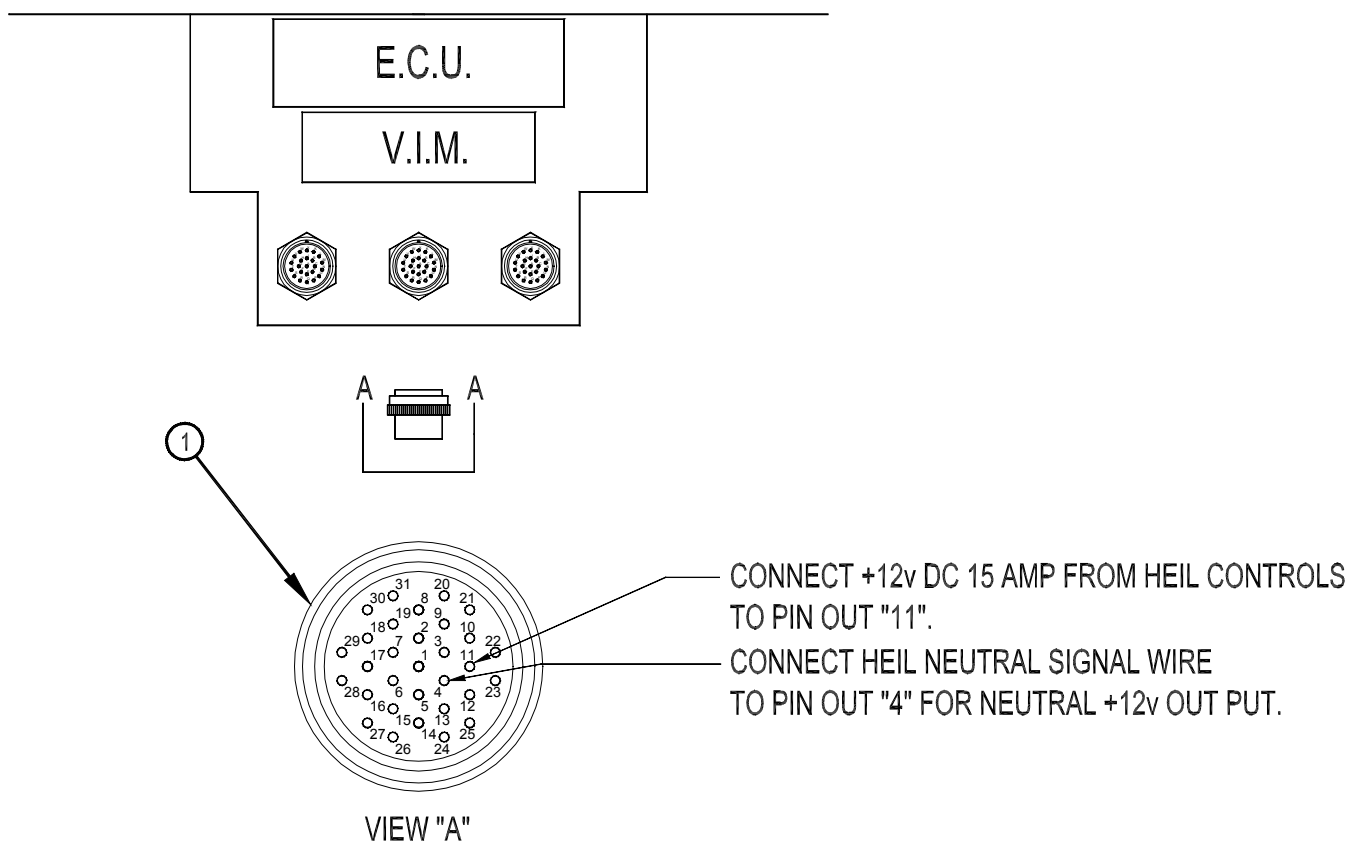
REF	PART NO.	DESCRIPTION	REQ'D
1	054-7350	TUBING, shrink	2"
2	054-8881-003	FITTING, reducer – brass	1
3	108-4943-003	TERMINAL, ring	2
4	108-5617	SWITCH, pressure – N.C.	1
5	354-0202-006	TEE, male	1



**NEUTRAL SWITCH KIT for
NAVISTAR CHASSIS with ALLISON WORLD TRANSMISSION
272-3183-008**

REF	PART NO.	DESCRIPTION	REQ'D
1	069-0032	KIT, micro relay (see section 6)	1
2	047-2151-001	TEK SCREW	1
3	108-2648	DIODE	1
4	108-4470	LOOM, electrical.....	3ft
5	108-5233-022	WIRE – 16 GA (white).....	3ft
6	108-5717-022	CONNECTOR, butt.....	3
7	108-6363	TUBING, shrink	3

**NEUTRAL SWITCH KIT for
STERLING 1999 CHASSIS with ALLISON WORLD TRANSMISSION
272-3183-009**

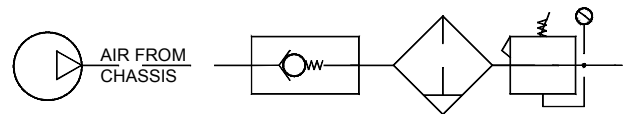


**NEUTRAL SWITCH KIT for
STERLING 1999 CHASSIS with ALLISON WORLD TRANSMISSION
272-3183-009**

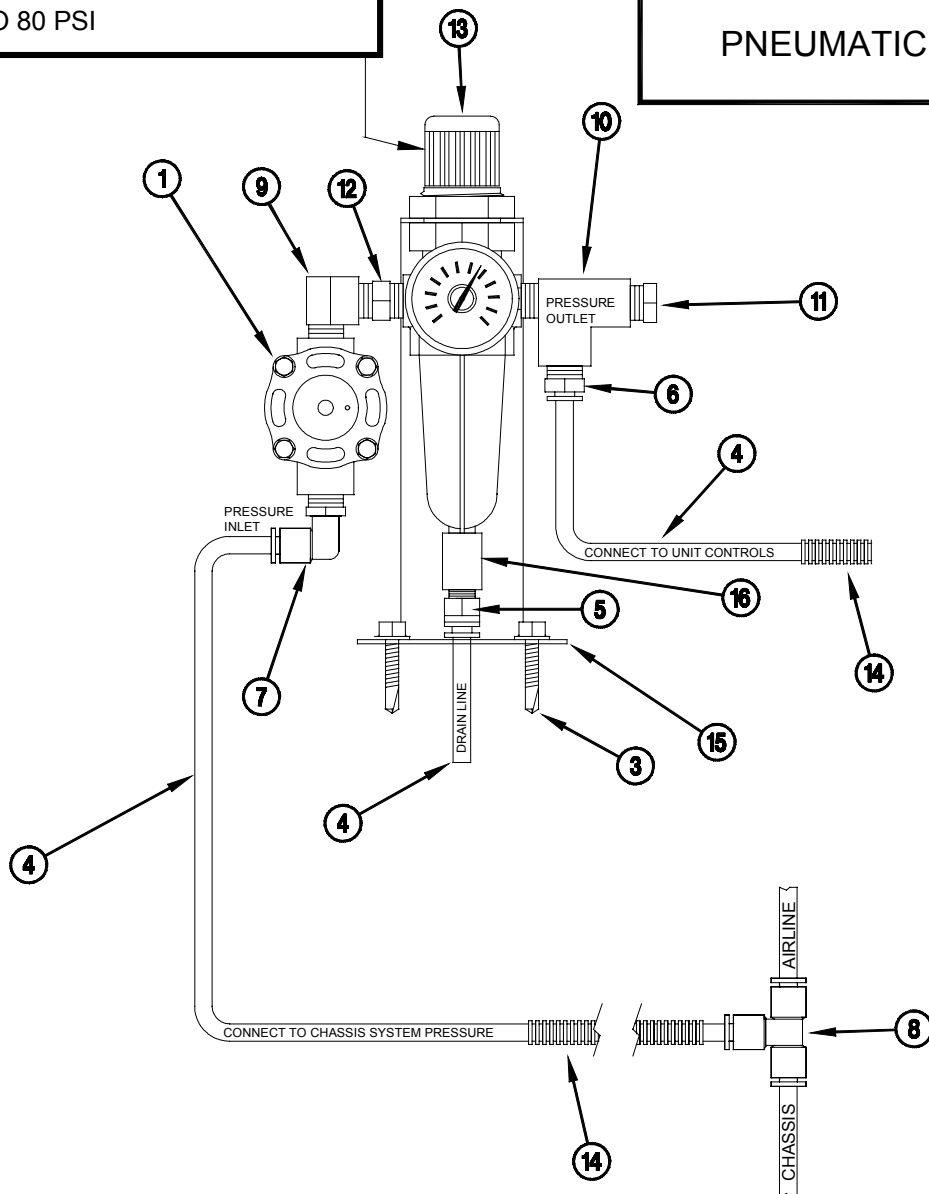
REF	PART NO.	DESCRIPTION	REQ'D
1	108-4815-004	PLUG, deutsch	1
2	108-4815-111	SOCKET, deutsch	2
3	108-4815-114	PLUG, sealing	29

AIR SUPPLY PARTS for 272-7464-001

NOTE: ADJUST REGULATOR
TO 80 PSI



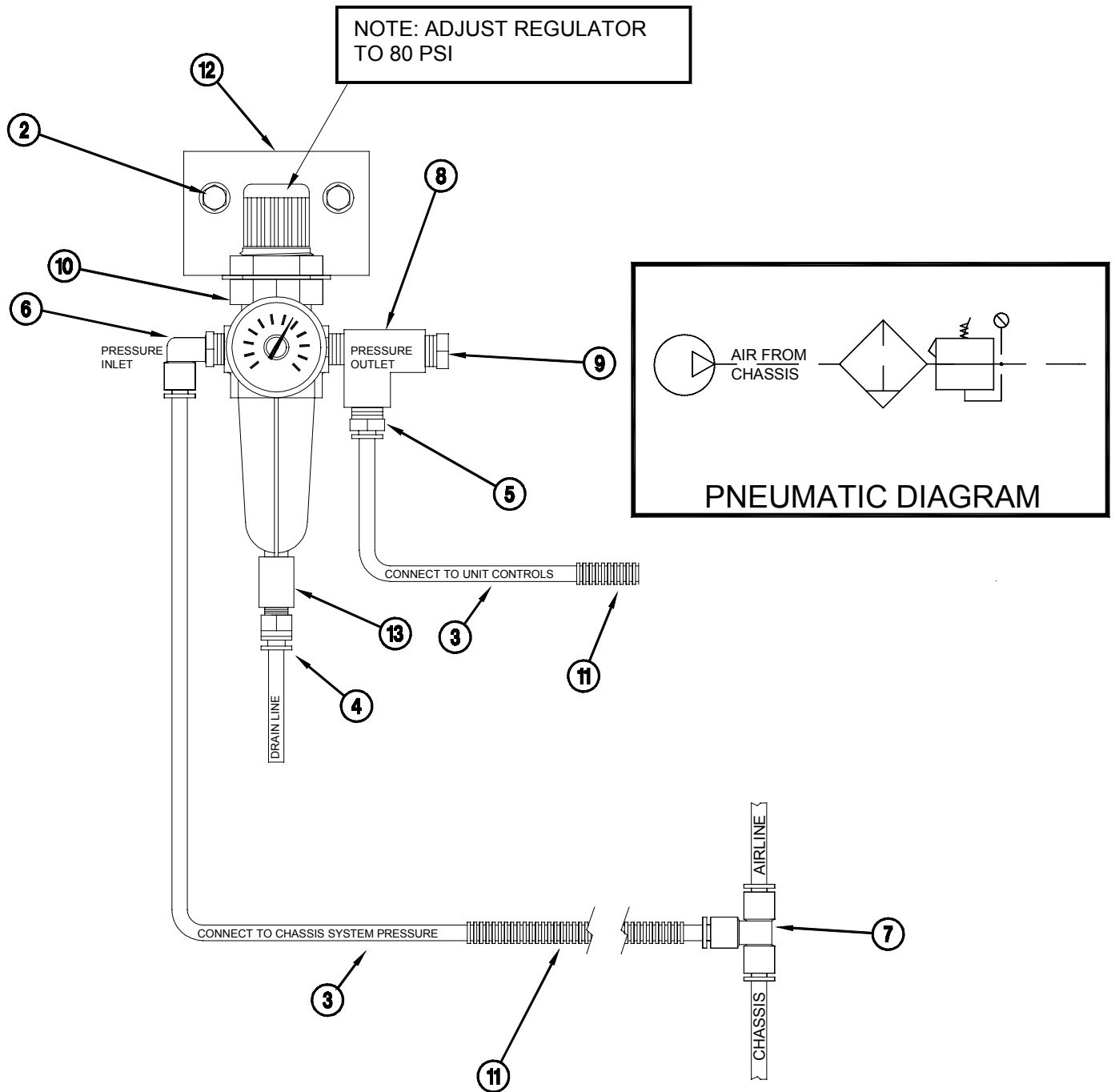
PNEUMATIC DIAGRAM



**AIR SUPPLY PARTS for
272-7464-001**

REF	PART NO.	DESCRIPTION	REQ'D
1	031-1909	VALVE, pressure protection	1
2	036-1115	CLAMP, strap	30
3	047-2151-011	SCREW, tek – 1/4"	2
4	054-5449	TUBE – 1/4"	20ft
5	054-8468-003	CONNECTOR – 1/8" pipe x 1/4" tube	1
6	054-8468-004	CONNECTOR – 1/4" pipe x 1/4" tube	1
7	054-8470-004	ELBOW, 90° 1/4" pipe x 1/4" tube	1
8	054-8472-002	TEE – 1/4"	1
9	054-8739-002	ELBOW, 90° street – 1/4" NPT	1
10	054-8740-002	TEE, street	1
11	054-8925-002	PLUG, pipe – 1/4"	1
12	054-8927-002	NIPPLE, pipe – 1/4"	1
13	075-0721	FILTER/REGULATOR – with gauge	1
14	108-4498	LOOM, electrical	20ft
15	211-9966	BRACKET, filter/regulator	1
16	FS640400	COUPLING, pipe	1

AIR SUPPLY PARTS for 272-7464-002

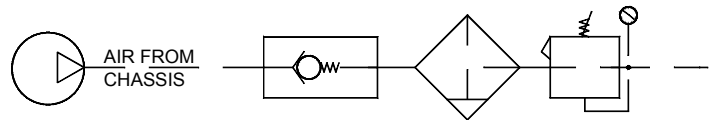
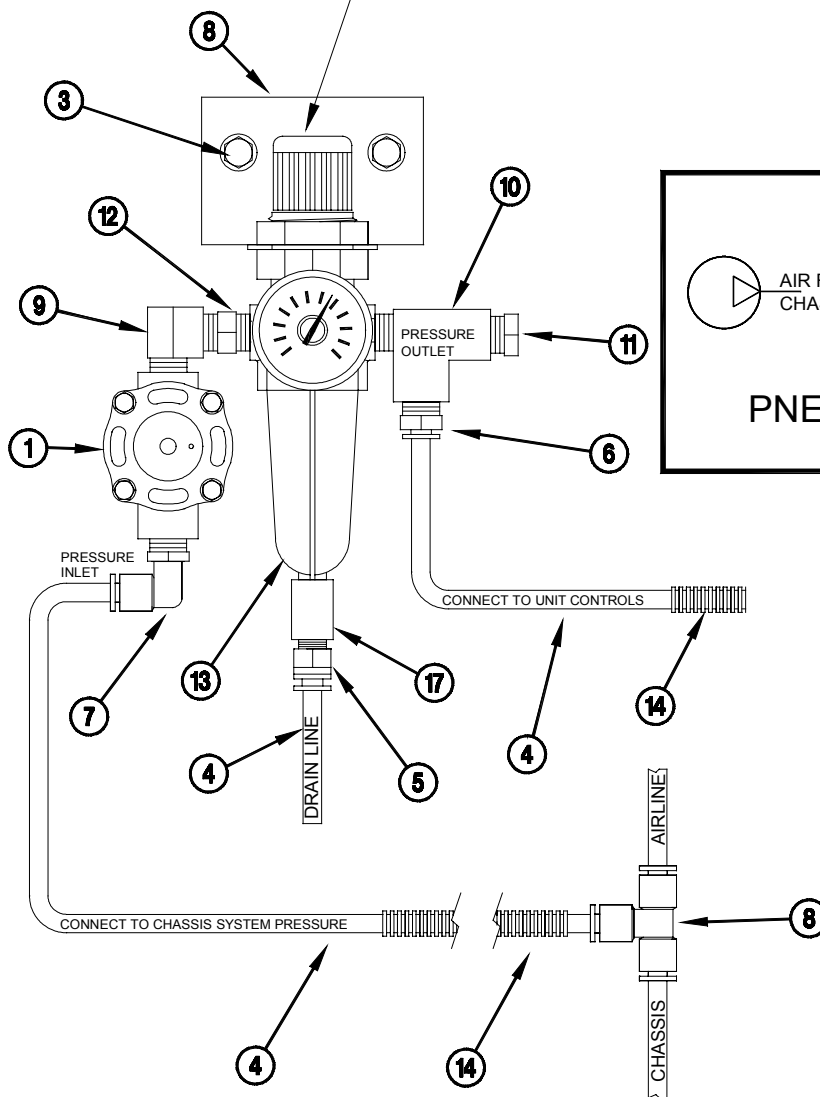


**AIR SUPPLY PARTS for
272-7464-002**

REF	PART NO.	DESCRIPTION	REQ'D
1	036-1115	CLAMP, strap.....	30
2	047-2151-011	SCREW, tek – 1/4".....	2
3	054-5449	TUBE – 1/4".....	20ft
4	054-8468-003	CONNECTOR – 1/8" pipe x 1/4" tube.....	1
5	054-8468-004	CONNECTOR – 1/4" pipe x 1/4" tube.....	1
6	054-8470-004	ELBOW, 90° 1/4" pipe x 1/4" tube.....	1
7	054-8472-002	TEE – 1/4".....	1
8	054-8740-002	TEE, street.....	1
9	054-8925-002	PLUG, pipe – 1/4".....	1
10	075-0721	FILTER/REGULATOR – with gauge.....	1
11	108-4498	LOOM, electrical.....	20ft
12	211-9967	BRACKET, filter/regulator.....	1
16	FS640400	COUPLING, pipe.....	1

AIR SUPPLY PARTS for 272-7464-03

NOTE: ADJUST REGULATOR TO
80 PSI

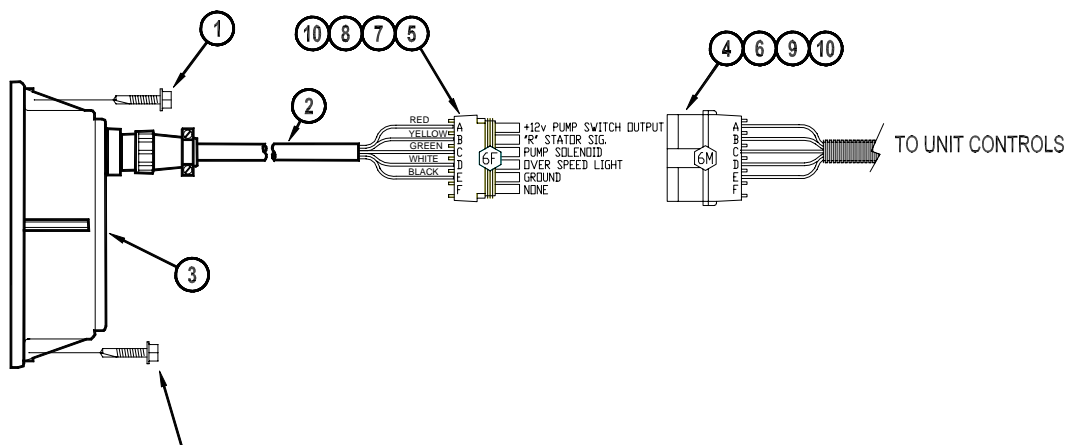


PNEUMATIC DIAGRAM

**AIR SUPPLY PARTS for
272-7464-03**

REF	PART NO.	DESCRIPTION	REQ'D
1	031-1909	VALVE, pressure protection	1
2	036-1115	CLAMP, strap	30
3	047-2151-011	SCREW, tek – 1/4"	2
4	054-5449	TUBE – 1/4"	20ft
5	054-8468-003	CONNECTOR – 1/8" pipe x 1/4" tube	1
6	054-8468-004	CONNECTOR – 1/4" pipe x 1/4" tube	1
7	054-8470-004	ELBOW, 90° 1/4" pipe x 1/4" tube	3
8	054-8472-002	TEE – 1/4"	1
9	054-8739-002	ELBOW, 90° street – 1/4" NPT	1
10	054-8740-002	TEE, street	1
11	054-8925-002	PLUG, pipe – 1/4"	1
12	054-8927-002	NIPPLE, pipe – 1/4"	1
13	075-0721	FILTER/REGULATOR – with gauge	1
14	108-4498	LOOM, electrical	20ft
15	211-9967	BRACKET, filter/regulator	1
16	FS640400	COUPLING, pipe	1

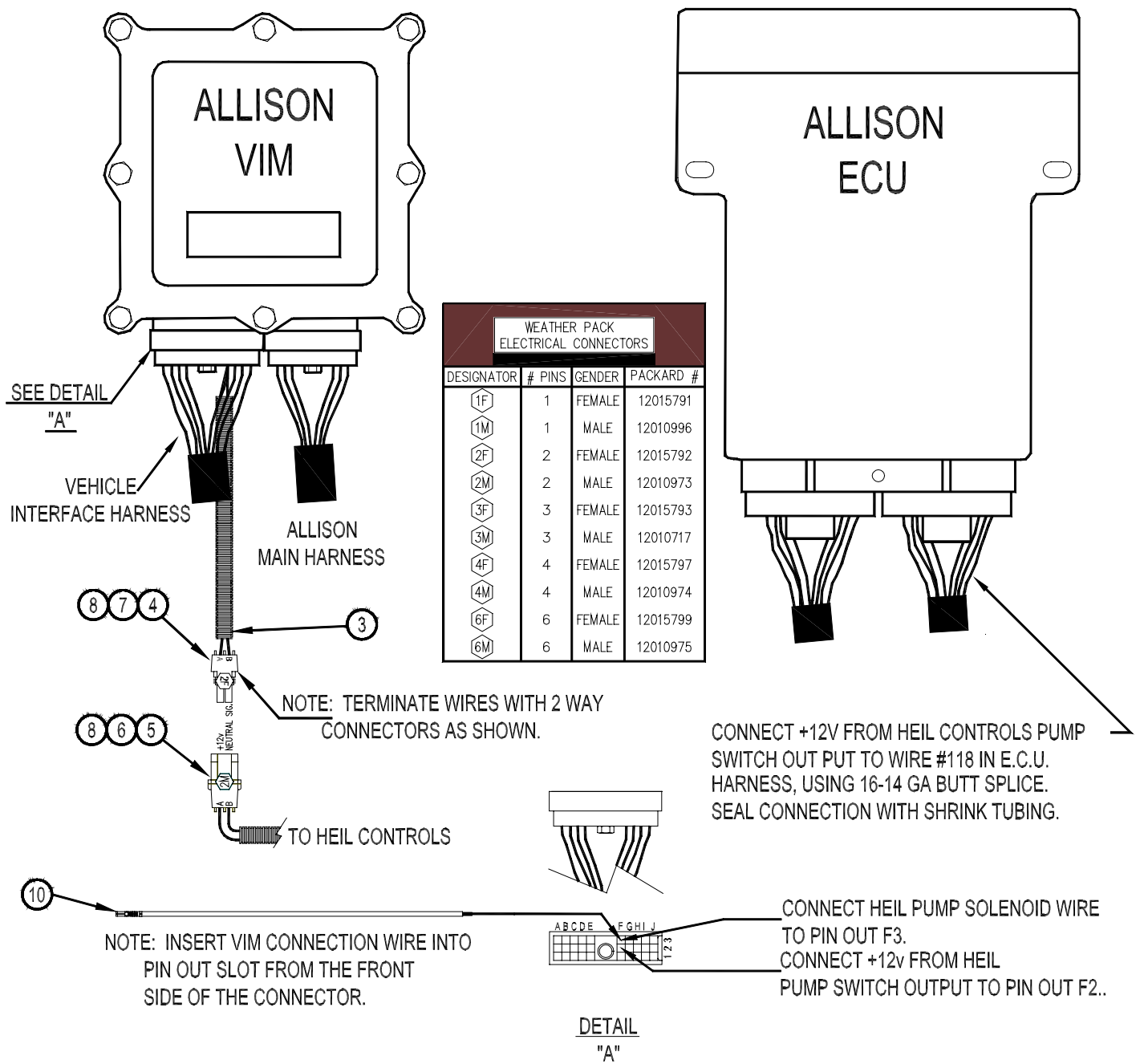
**(EOS) ELECTRONIC OVERSPEED SWITCH KIT for
UNITS WITHOUT ALLISON TRANSMISSION
272-7738-001**



**(EOS) ELECTRONIC OVERSPEED SWITCH KIT for
UNITS WITHOUT ALLISON TRANSMISSION
272-7738-001**

REF	PART NO.	DESCRIPTION	REQ'D
1	047-2151-011	TEK SCREW – 1/4"	2
2	108-4545-001	CABLE	1
3	108-4545-002	SWITCH, eos.....	1
4	108-4827-009	CONNECTOR, 6-way male	1
5	108-4827-010	CONNECTOR, 6-way female	1
6	108-4827-111	TERMINAL, male.....	5
7	108-4827-120	TERMINAL, female.....	5
8	108-4827-130	SEAL, cable	5
9	108-4827-131	SEAL, cable	5
10	108-4827-133	PLUG, cavity	2

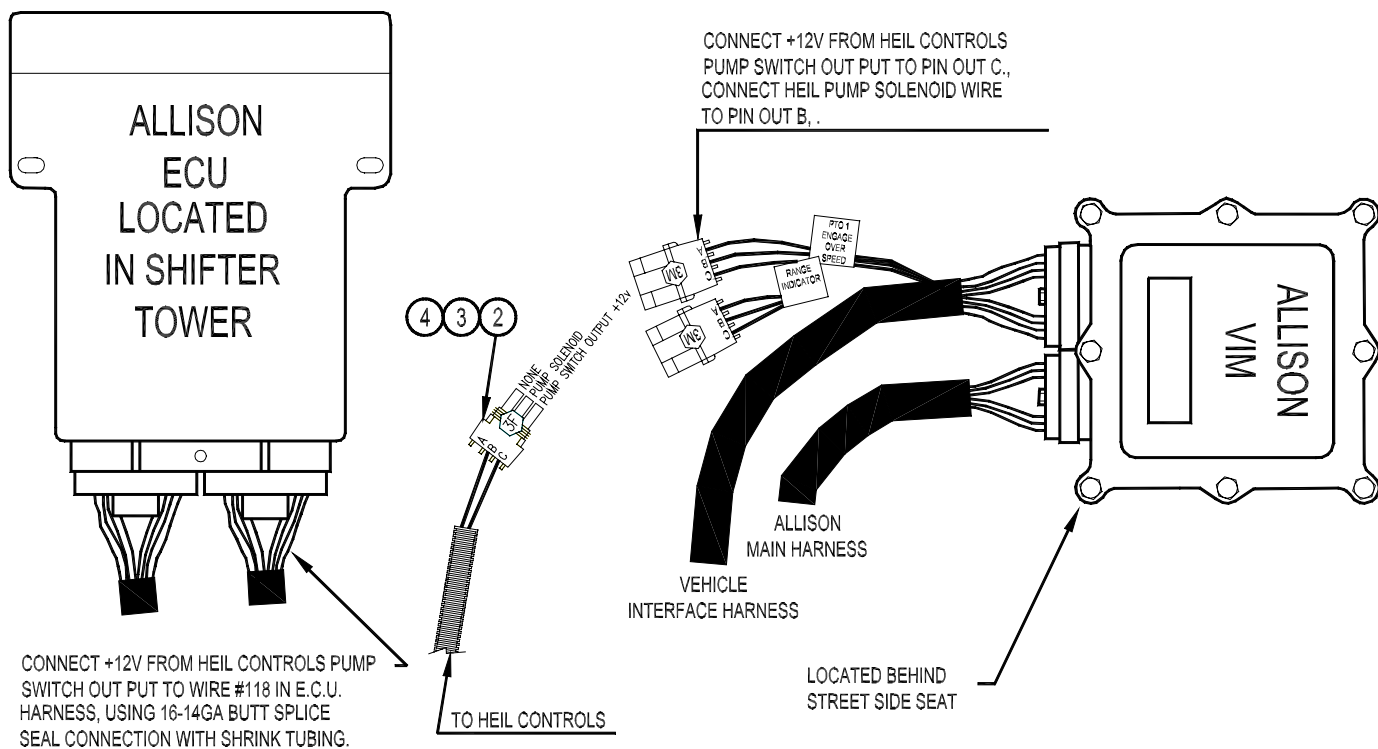
**(EOS) ELECTRONIC OVERSPEED SWITCH KIT for
UNITS with ALLISON TRANSMISSION
272-7738-02**



**(EOS) ELECTRONIC OVERSPEED SWITCH KIT for
UNITS with ALLISON TRANSMISSION
272-7738-02**

REF	PART NO.	DESCRIPTION	REQ'D
1	036-1115	TIE, plastic.....	3
2	054-7350	TUBIGN, shrink.....	5"
3	108-4498	LOOM.....	1ft
4	108-4827-003	CONNECTOR, 2-way male.....	1
5	108-4827-004	CONNECTOR, 2-way female.....	1
6	108-4827-111	TERMINAL, male.....	2
7	108-4827-121	TERMINAL, female.....	2
8	108-4827-131	SEAL, cable.....	4
9	108-5717-002	CONNECTOR, butt.....	3
10	108-6362	WIRE, VIM connection.....	2

**(EOS) ELECTRONIC OVERPEED SWITCH KIT for
ALLISON WORLD TRANSMISSION/ PETERBILT 320
272-7738-003**

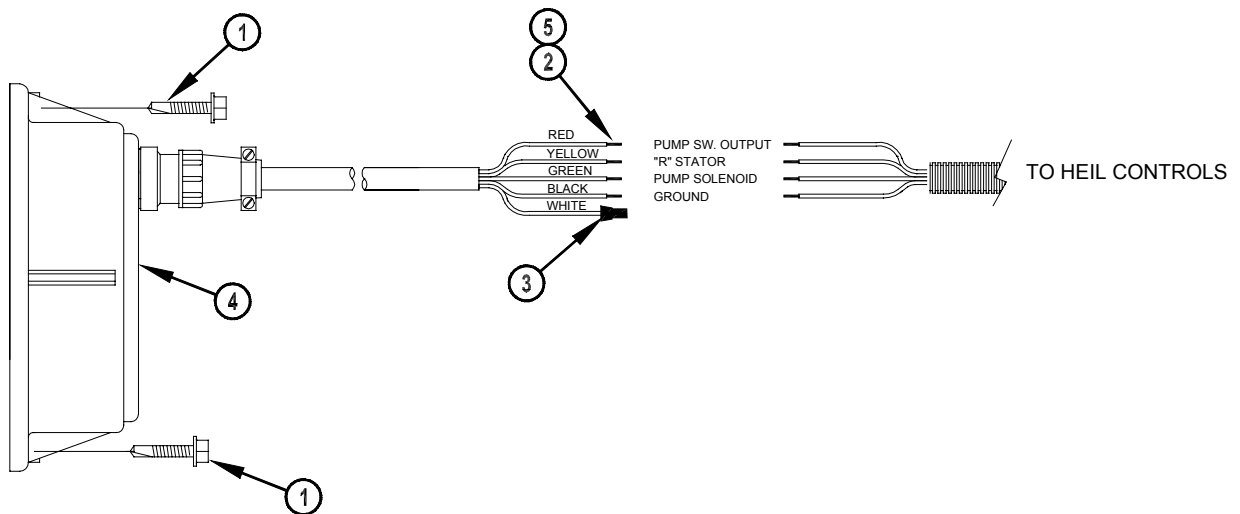


WEATHER PACK ELECTRICAL CONNECTORS			
DESIGNATOR	# PINS	GENDER	PACKARD #
1F	1	FEMALE	12015791
1M	1	MALE	12010996
2F	2	FEMALE	12015792
2M	2	MALE	12010973
3F	3	FEMALE	12015793
3M	3	MALE	12010717
4F	4	FEMALE	12015797
4M	4	MALE	12010974
6F	6	FEMALE	12015799
6M	6	MALE	12010975

**(EOS) ELECTRONIC OVERPEED SWITCH KIT for
ALLISON WORLD TRANSMISSION/ PETERBILT 320
272-7738-003**

REF	PART NO.	DESCRIPTION	REQ'D
1	054-7350	TUBING, shrink	2"
2	108-4827-006	CONNECTOR, 3-way female	1
3	108-4827-121	TERMINAL, female	2
4	108-4827-131	SEAL, cable.....	2
5	108-5717-002	CONNECTOR, butt.....	1

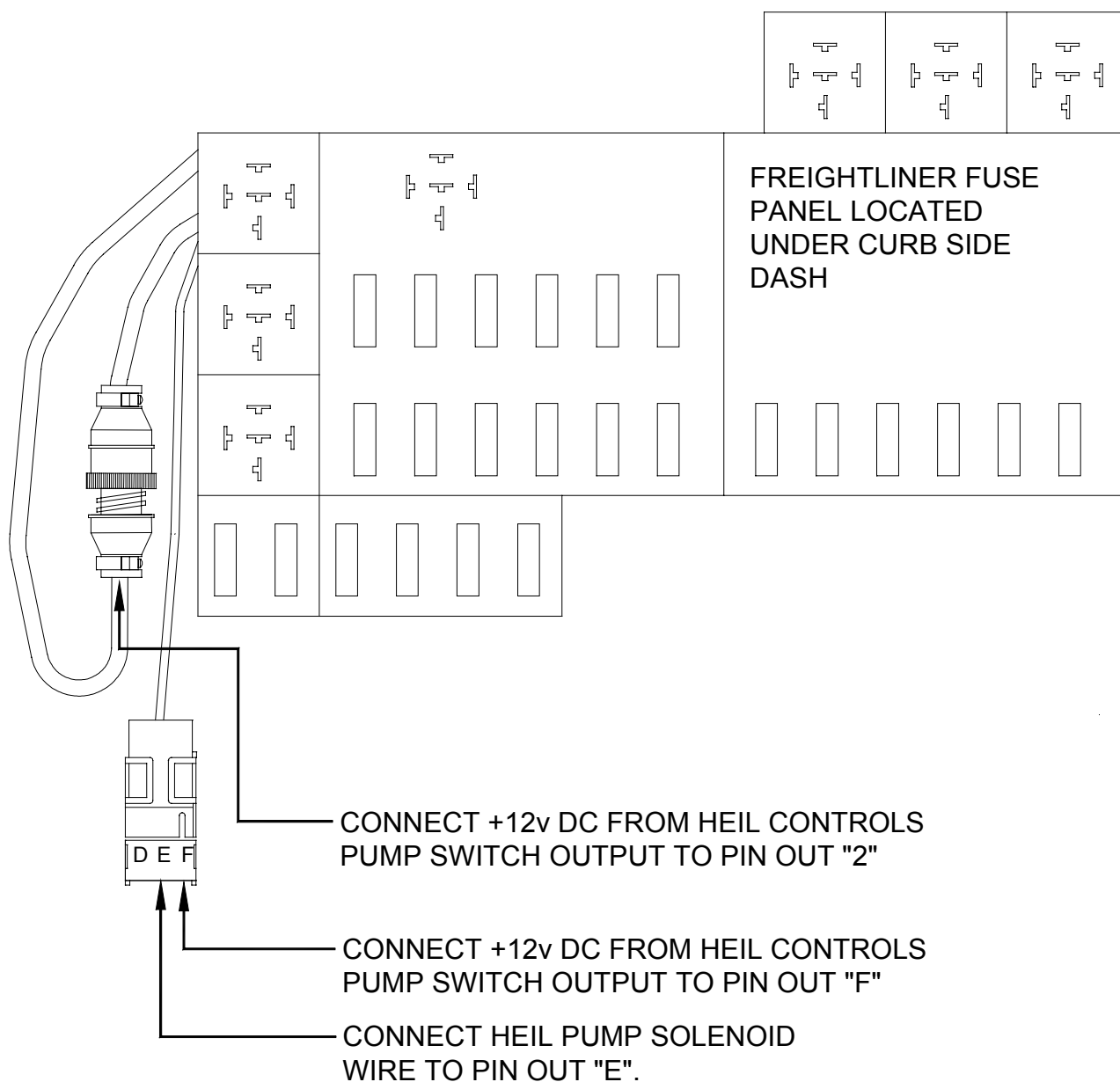
**(EOS) ELECTRONIC OVERSPEED SWITCH KIT for
ALLISON WORLD TRANSMISSION and 24v DC
272-7738-124**



**(EOS) ELECTRONIC OVERSPEED SWITCH KIT for
ALLISON WORLD TRANSMISSION and 24v DC
272-7738-124**

REF	PART NO.	DESCRIPTION	REQ'D
1	047-2151-011	TEK SCREW	2
2	054-7350	TUBING, shrink	8"
3	108-3647	CAP, wire.....	1
4	108-4887	SWITCH, electronic overspeed – 24v	1
5	108-5717-002	CONNECTOR, butt.....	4

**(EOS) ELECTRONIC OVERSPEED SWITCH KIT for
ALLISON WORLD TRANSMISSION AND FREIGHTLINER CHASSIS
272-7738-005**



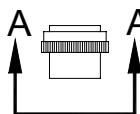
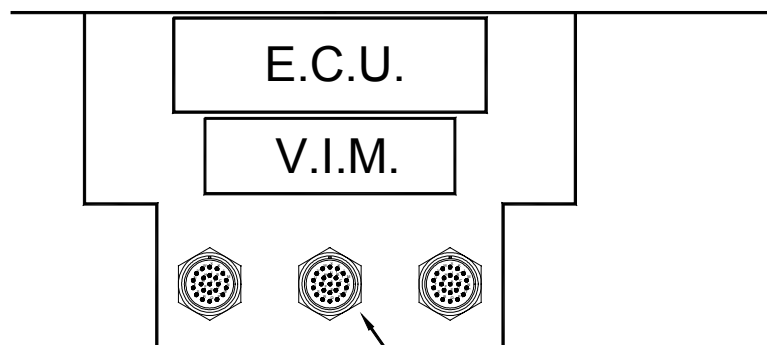
NOTE: INSERT TERMINAL INTO
REAR OF CONNECTORS.

**(EOS) ELECTRONIC OVERSPEED SWITCH KIT for
ALLISON WORLD TRANSMISSION AND FREIGHTLINER CHASSIS
272-7738-005**

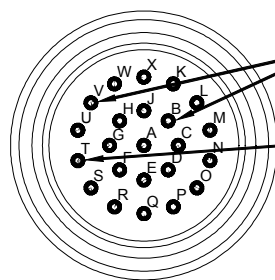
REF	PART NO.	DESCRIPTION	REQ'D
1	108-6783	TERMINAL	2
2	108-5587	TERMINAL, amp	1

**(EOS) ELCTRONIC OVERSPEED SWITCH KIT for
ALLISON WORLD TRANSMISSION and FORD LOUISVILLE CHASSIS
272-7738-006**

TRANSMISSION E.C.U. & V.I.M ARE LOCATED
BENEATH FLOOR ATTACHED TO UNDER SIDE
OF ACCESS PANEL OVER TRANSMISSION



NOTE: INSERT DEUTSCH SOCKETS (ITEM 1)
INTO MIDDLE CONNECTOR
IN HEIL NEUTRAL KIT



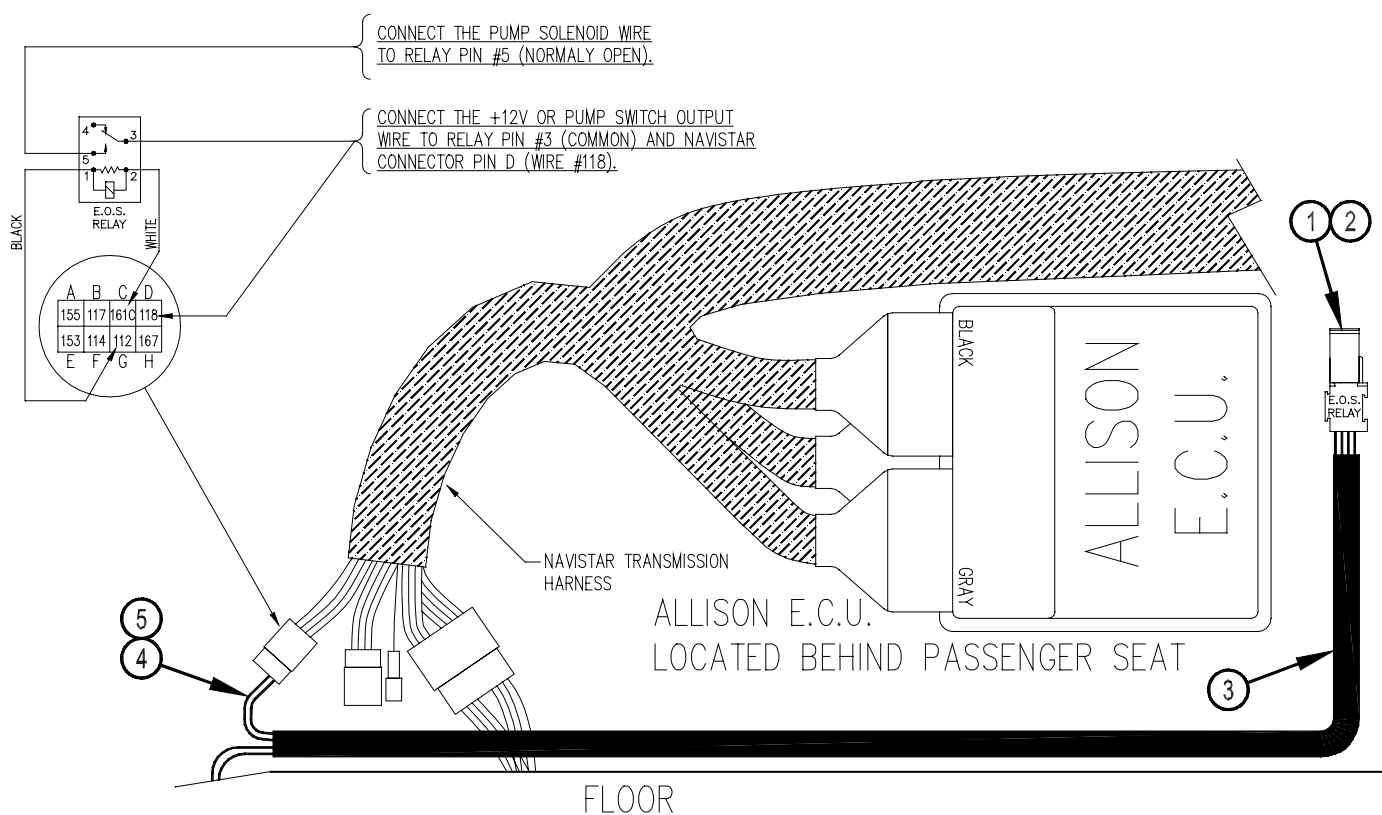
VIEW "A"

CONNECT +12v DC FROM HEIL CONTROLS PUMP
SWITCH OUTPUT TO PIN OUTS "V" & "B".
CONNECT HEIL PUMP SOLENOID WIRE
TO PIN OUT "T" .

**(EOS) ELCTRONIC OVERSPEED SWITCH KIT for
ALLISON WORLD TRANSMISSION and FORD LOUISVILLE CHASSIS
272-7738-006**

REF	PART NO.	DESCRIPTION	REQ'D
1	108-4815-111	SOCKET.....	3

**(EOS) ELECTRONIC OVERSPEED SWITCH KIT for
ALLISON WORLD TRANSMISSION and NAVISTAR 1998 MODEL and AFTER
272-7738-008**

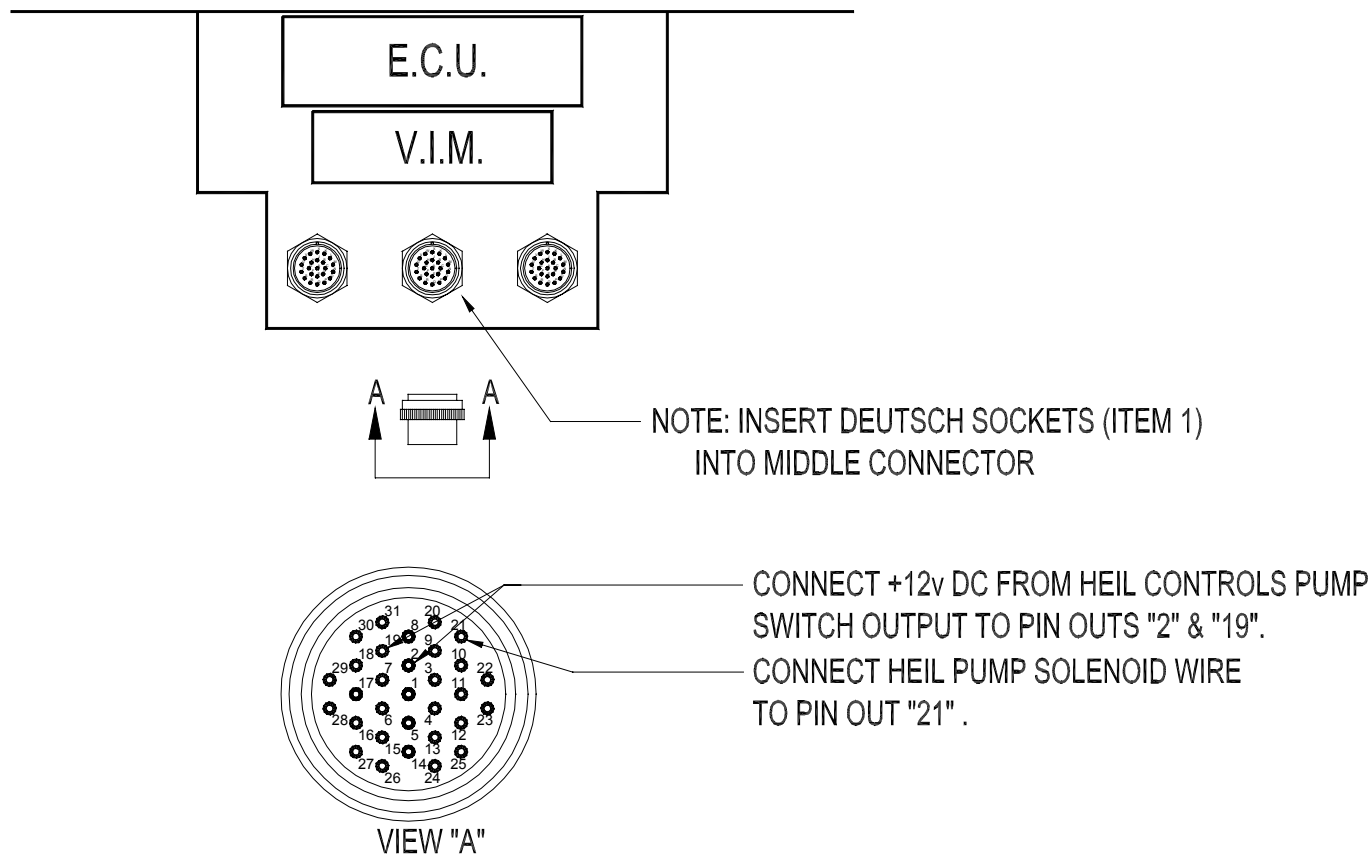


**(EOS) ELECTRONIC OVERSPEED SWITCH KIT for
ALLISON WORLD TRANSMISSION and NAVISTAR 1998 MODEL and AFTER
272-7738-008**

REF	PART NO.	DESCRIPTION	REQ'D
1	069-0032	KIT, micro relay (see section 6)	1
2	047-2151-001	TEK SCREW	1
3	108-4470	LOOM – 3/8"	3ft
4	108-5233-017	WIRE – 16 GA – (black)	3ft
5	108-5233-022	WIRE – 16 GA – (white).....	3ft

**(EOS) ELECTRONIC OVERSPEED SWITCH KIT for
ALLISON WORLD TRANSMISSION and STERLING CHASSIS
272-7738-009**

TRANSMISSION E.C.U. & V.I.M ARE LOCATED
BENEATH FLOOR ATTACHED TO UNDER SIDE
OF ACCESS PANEL OVER TRANSMISSION



**(EOS) ELECTRONIC OVERSPEED SWITCH KIT for
ALLISON WORLD TRANSMISSION and STERLING CHASSIS
272-7738-009**

REF	PART NO.	DESCRIPTION	REQ'D
1	108-4815-111	SOCKET.....	3

SECTION 4 – HYDRAULIC CIRCUITS and FITTINGS

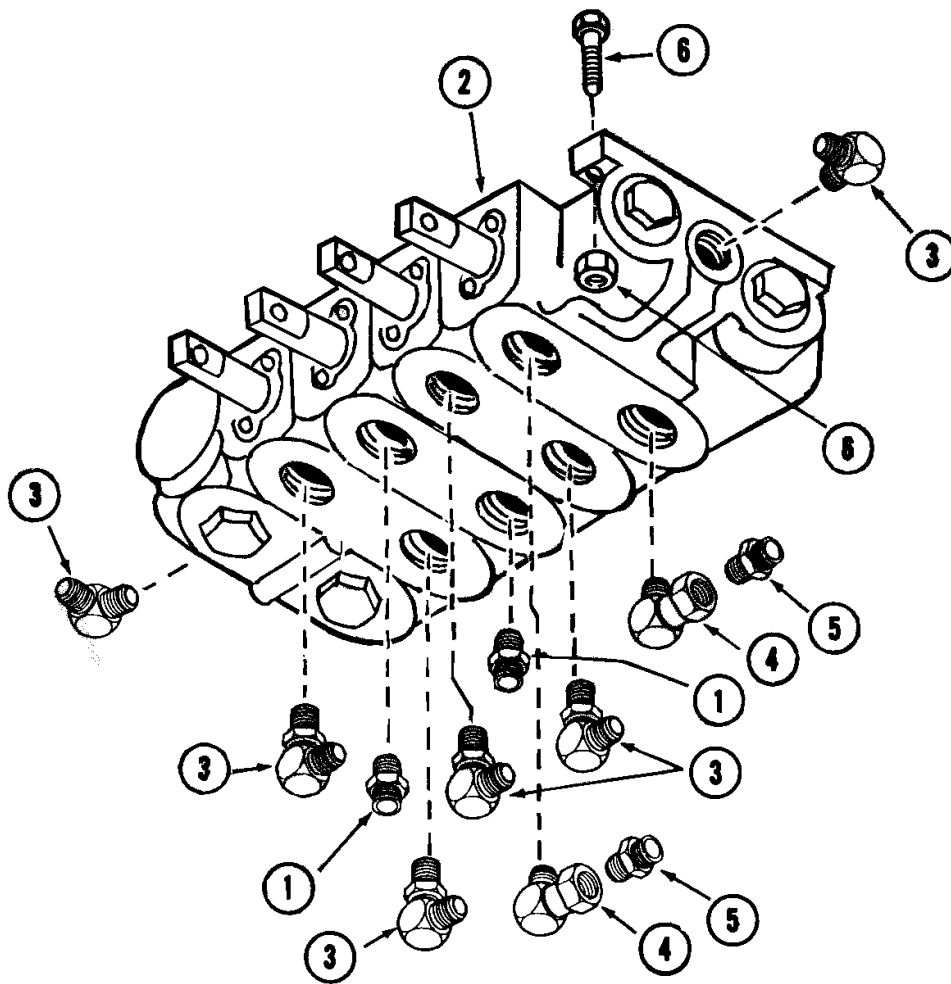
Hydraulics;

Tailgate Valve with Fittings.....	4.2
Oil Tank to Underbody Valve	4.4
Body	4.6
Underbody Valve with Fittings	4.8
Tailgate without Regenerative Valve	4.10
Tailgate with Regenerative Valve	4.12
Tailgate Control Valve	4.14
Winch	4.16
Arm or Roll Bar Mechanism	4.18
Grab-Bar Flipper	4.20

Pump Kits;

Direct Mount (272-2623)	4.22
PTO/Pump Drive (272-1870)	4.23.2
Ford L Series Chassis (272-5859).....	4.24
Ford Louisville (272-8418).....	4.26
Crane Carrier (272-5860)	4.28
WX Volvo (272-5090/272-5090-01)	4.30
WXLL Volvo (272-8016).....	4.32
WG Volvo (272-8024).....	4.34
MR Mack (272-3460).....	4.36
Kenworth/Peterbilt (272-6486)	4.38
Navistar (272-8040/272-8040-01).....	4.40
Pump Kit with Overspeed (272-5855)	4.42
Hose Kit (272-5630)	4.44
Sterling – Front Mount Pump Installation (372-0355)	4.46
Flow Control Kit (272-5859)	4.48
Pump Kit with Flow Control (272-8460)	4.50
Hose Kit (272-8459)	4.52
Front Mount Pump Kit (272-7153)	4.54
Front Mount Hose Kit (272-8423).....	4.56
Pump Air Shift Kit (272-7973).....	4.58
Electric/Air Shift Kit with Overspeed (108-5354)	4.60
Electric/Air Shift Kit without Overspeed (108-5355)	4.62
Pressure Test Gauge Kit (272-6347).....	4.64
PTO Mount Tandem Vane Pump Installation (372-2280)	4.66
Front Mount Tandem Vane Pump Installation (372-2281).....	4.68

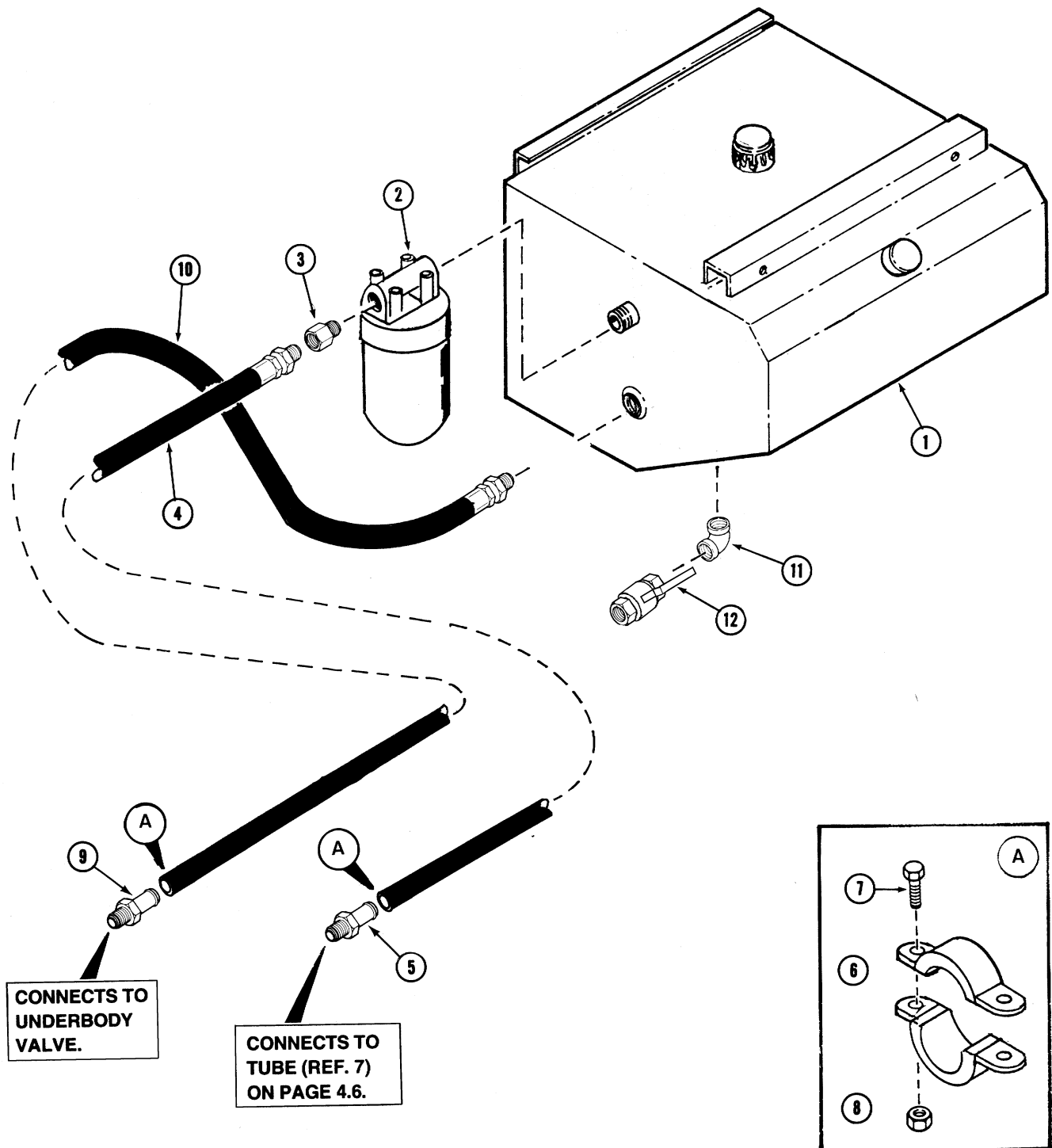
TAILGATE VALVE with FITTINGS



FORMULA 4000**TAILGATE VALVE with FITTINGS**

REF	PART NO.	DESCRIPTION	REQ'D
1	054-3341-008	CONNECTOR.....	1
2	REF.	VALVE, tailgate control (see section 5)	1
3	054-3340-008	ELBOW, 90°	6
4	054-2988-006	ELBOW, 90° swivel.....	2
5	058-3205-019	CONNECTOR, reducing.....	2
6	FS071124	CAPSCREW – 1/2" – 13NC x 1-1/2" (valve mounting).....	4
	FS231100	NUT, lock – 1/2" – 13NC	4

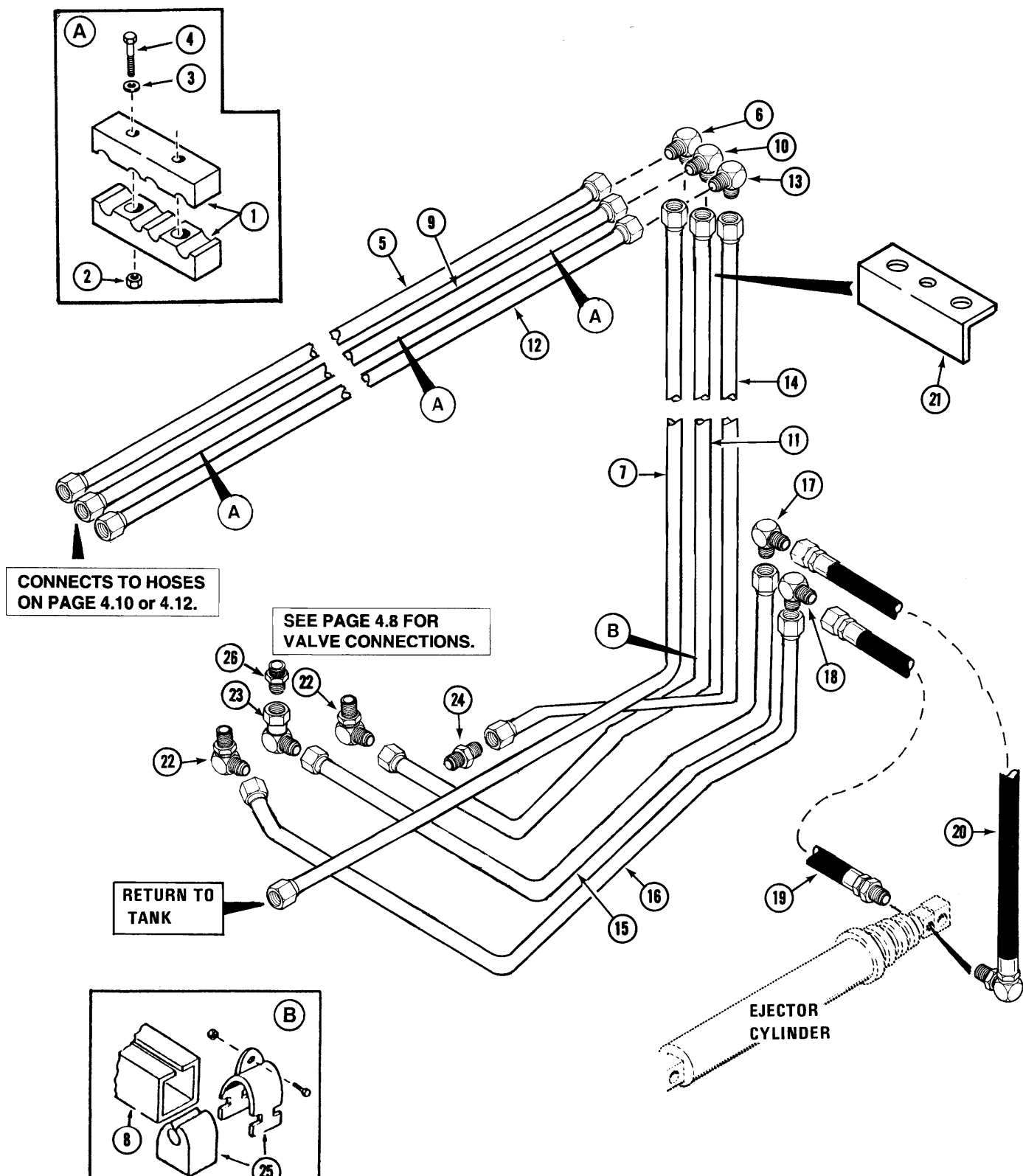
OIL TANK and FILTER HYDRAULICS



OIL TANK and FILTER HYDRAULICS

REF	PART NO.	DESCRIPTION	REQ'D
1	REF.	TANK, oil – (See Section 2)	1
2	REF.	FILTER, oil – (See Section 5)	1
3	FS592200	BUSHING, reducing	1
4	057-2183-003	HOSE, low pressure	1
5	058-8584-003	FITTING, hose	1
6	074-2216-003	CLAMP, hose – (halves)	2
7	FS100826	CAPSCREW – 5/16" – 24NF x 1-3/4"	4
8	FS240800	NUT, lock – 5/16" – 24NF	4
9	058-3248-003	FITTING, swivel	1
10	057-2183-072	HOSE, low pressure	1
11	FS743000	ELBOW, 90° - 2"	1
12	272-4016	SUCTION LINE SHUT-OFF VALVE KIT	1

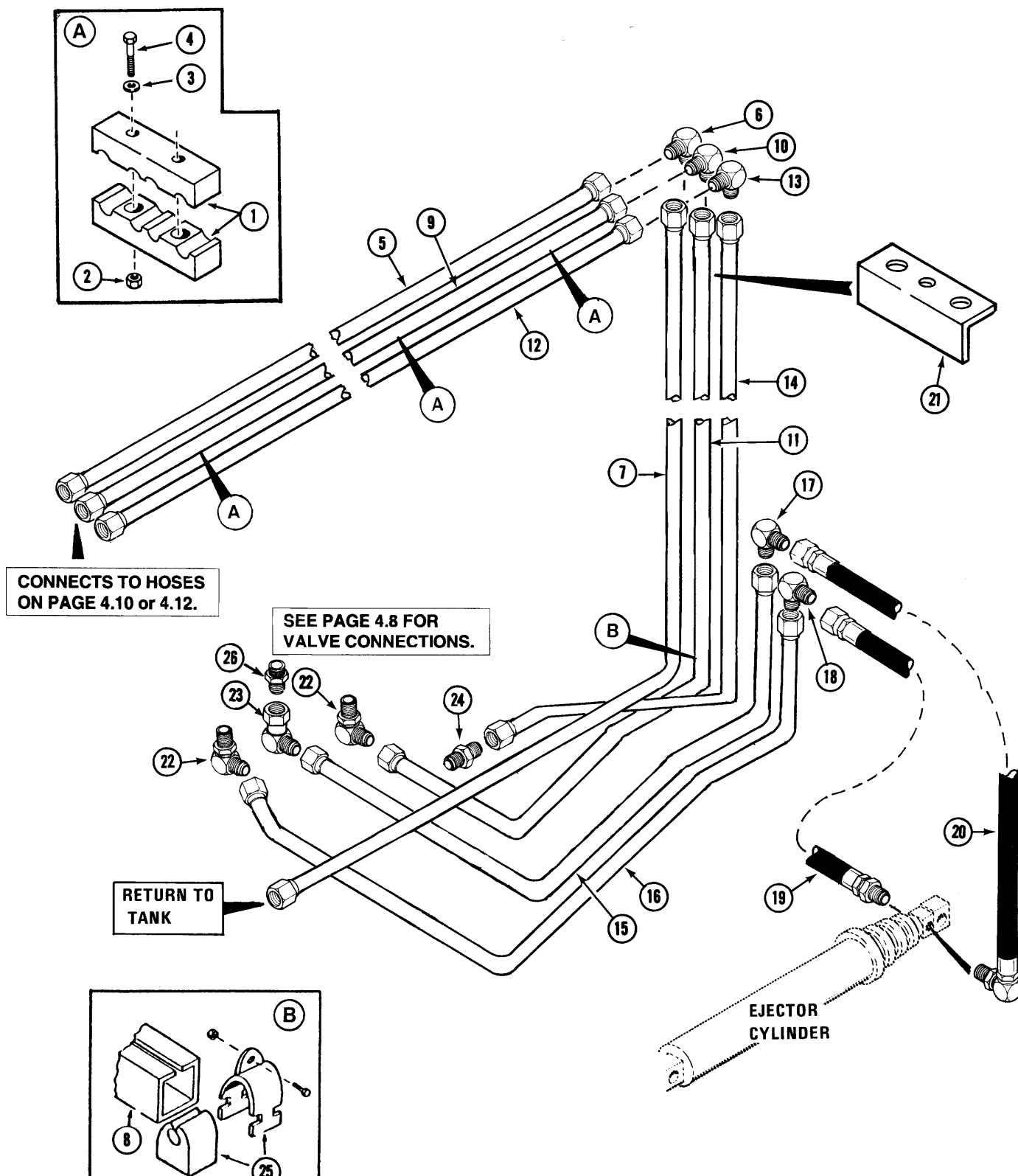
BODY HYDRAULICS



BODY HYDRAULICS

REF	PART NO.	DESCRIPTION	REQ'D
1	036-1485	CLAMP, tube	A/R
2	FS230900	NUT, lock – 3/8" – 16NC	A/R
3	FS510900	WASHER, lock – 3/8"	A/R
4	FS070936	CAPSCREW – 3/8" – 16NC x 2-3/4"	A/R
5	054-9330-001	TUBE, hydraulic (11 yd – 84" wide units).....	1
	054-9330-002	TUBE, hydraulic (13 yd – 84" wide units).....	1
	054-9330-003	TUBE, hydraulic (16 yd – 84" wide units).....	1
	054-9330-004	TUBE, hydraulic (18 yd – 84" wide units).....	1
	054-8900-001	TUBE, hydraulic (13 yd – 96" wide units).....	1
	054-8900-002	TUBE, hydraulic (16 yd – 96" wide units).....	1
	054-8900-003	TUBE, hydraulic (18 yd – 96" wide units).....	1
	054-8900-004	TUBE, hydraulic (20 yd – 96" wide units).....	1
	054-8900-005	TUBE, hydraulic (25 yd – 96" wide units).....	1
6	054-3533-010	ELBOW, 90° bulkhead.....	1
7	054-9321	TUBE, hydraulic (11 thru 20 yd units).....	1
	054-9328	TUBE, hydraulic (25 yd units)	1
8	207-2938-005	CHANNEL, clamp	1
9	054-9329-001	TUBE, hydraulic (11 yd – 84" wide units).....	1
	054-9329-002	TUBE, hydraulic (13 yd – 84" wide units).....	1
	054-9329-003	TUBE, hydraulic (16 yd – 84" wide units).....	1
	054-9329-004	TUBE, hydraulic (18 yd – 84" wide units).....	1
	054-8899-001	TUBE, hydraulic (13 yd – 96" wide units).....	1
	054-8899-002	TUBE, hydraulic (16 yd – 96" wide units).....	1
	054-8899-003	TUBE, hydraulic (18 yd – 96" wide units).....	1
	054-8899-004	TUBE, hydraulic (20 yd – 96" wide units).....	1
	054-8899-005	TUBE, hydraulic (25 yd – 96" wide units).....	1
10	054-3533-006	ELBOW, 90° bulkhead.....	1
11	054-9324	TUBE, hydraulic (11 thru 20 yd units).....	1
	054-9327	TUBE, hydraulic (25 yd units)	1
12	054-9331-001	TUBE, hydraulic (11 yd – 84" wide units).....	1
	054-9331-002	TUBE, hydraulic (13 yd – 84" wide units).....	1
	054-9331-003	TUBE, hydraulic (16 yd – 84" wide units).....	1
	054-9331-004	TUBE, hydraulic (18 yd – 84" wide units).....	1
	054-8898-001	TUBE, hydraulic (13 yd – 96" wide units).....	1
	054-8898-002	TUBE, hydraulic (16 yd – 96" wide units).....	1
	054-8898-003	TUBE, hydraulic (18 yd – 96" wide units).....	1
	054-8898-004	TUBE, hydraulic (20 yd – 96" wide units).....	1
	054-8898-005	TUBE, hydraulic (25 yd – 96" wide units).....	1
13	054-3533-008	ELBOW, 90° bulkhead.....	1
14	054-9323	TUBE, hydraulic (11 thru 20 yd units).....	1
	054-9326	TUBE, hydraulic (25 yd units)	1
15	054-7482	TUBE, hydraulic	1
16	054-7485	TUBE, hydraulic	1
17	054-3185-010	ELBOW, 90°	1

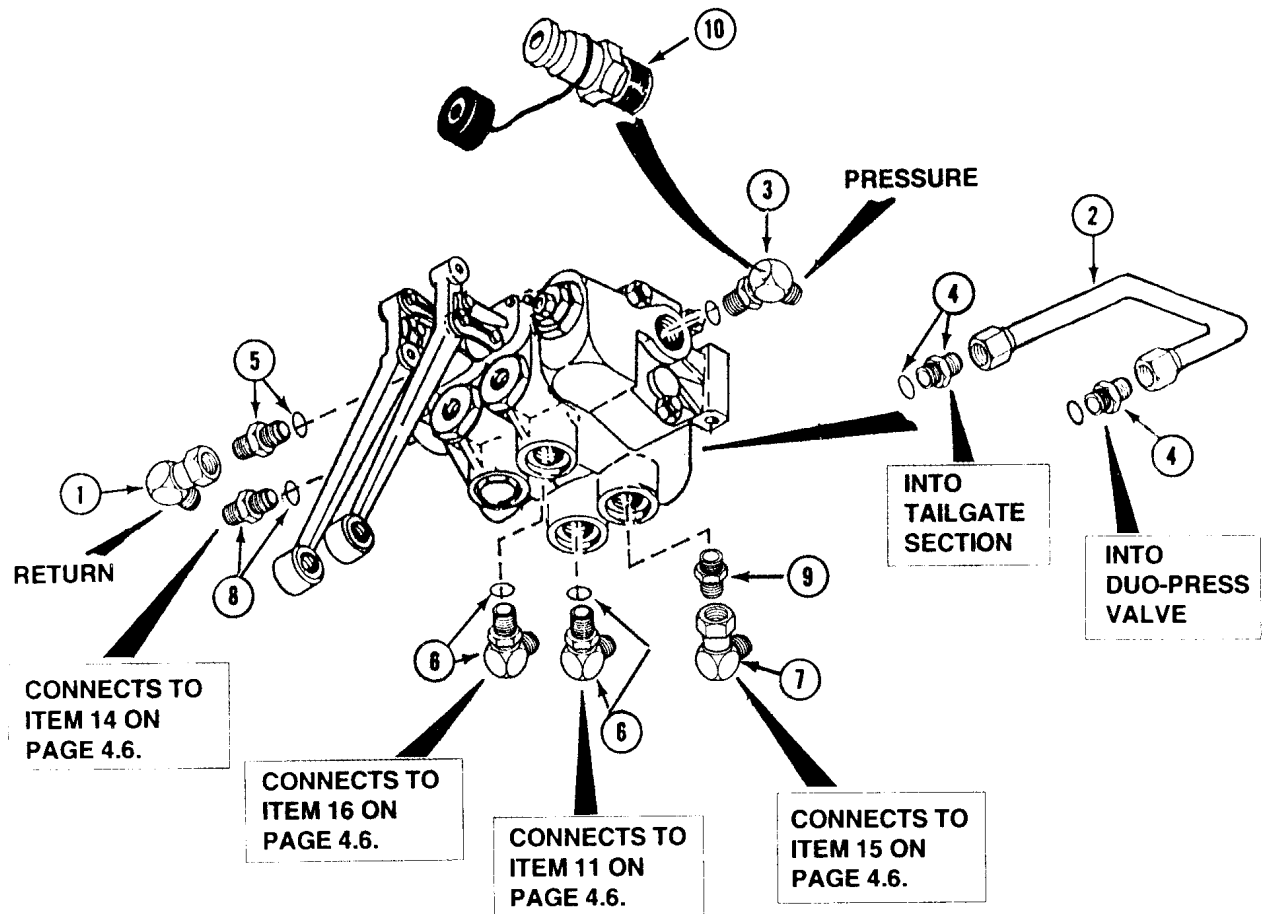
BODY HYDRAULICS



BODY HYDRAULICS

REF	PART NO.	DESCRIPTION	REQ'D
18	054-3185-008	ELBOW, 90°.....	1
19	057-2181-028	HOSE, hydraulic.....	1
20	057-2182-038	HOSE, hydraulic.....	1
21	211-4644	BRACKET, bulkhead.....	1
22	054-3237-013	ELBOW, 90° reducing.....	2
23	054-2988-010	ELBOW, 90°.....	1
24	054-3341-008	CONNECTOR, straight.....	1
25	036-1474-004	CLAMP, tube – 1/2".....	1
	036-1474-005	CLAMP, tube – 5/8".....	1
	036-1474-006	CLAMP, tube – 3/4".....	1
	036-1474-008	CLAMP, tube – 1".....	1
26	054-3341-007	CONNECTOR.....	1

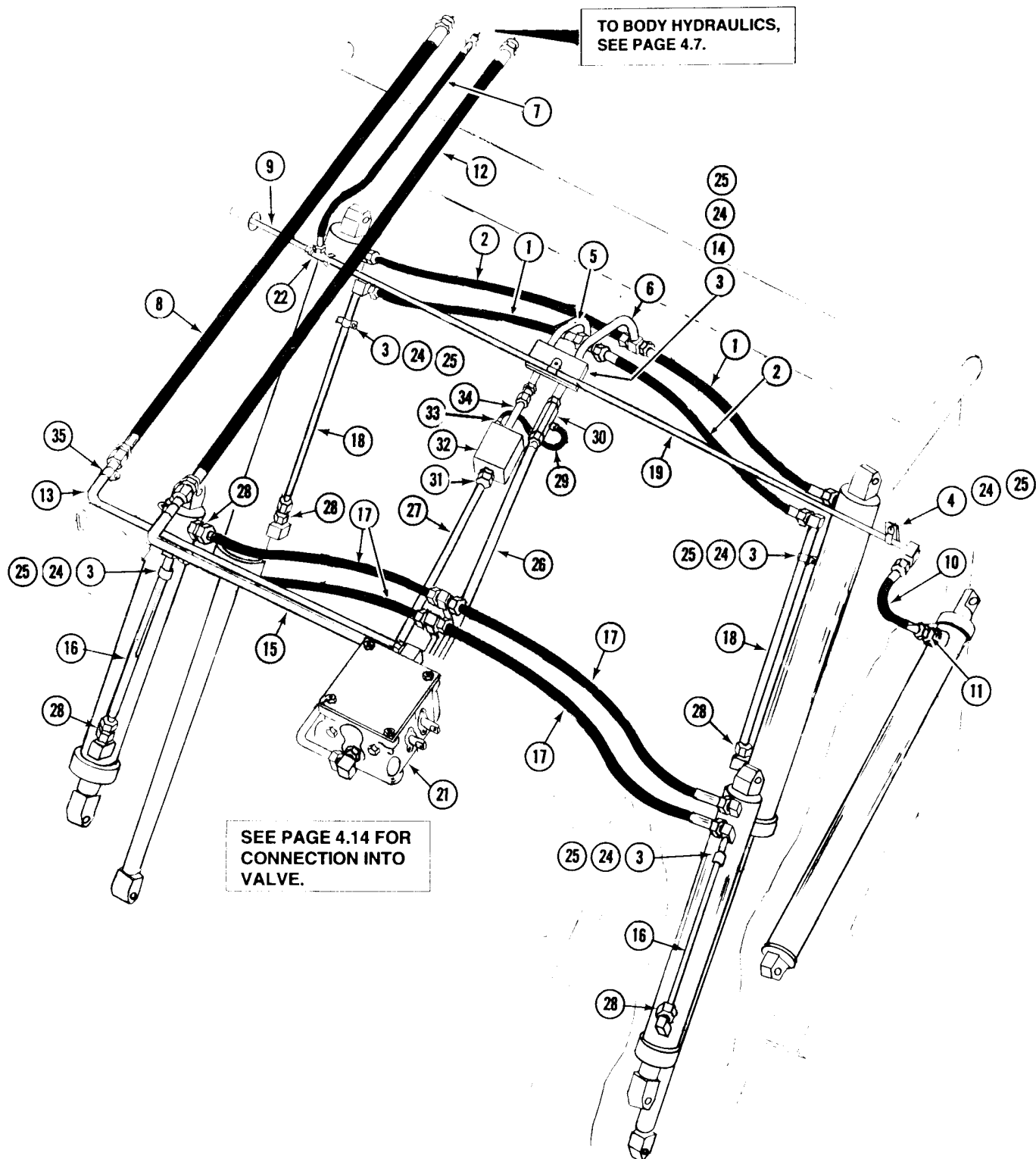
UNDERBODY VALVE with FITTINGS



UNDERBODY VALVE with FITTINGS

REF	PART NO.	DESCRIPTION	REQ'D
1	054-2988-010	ELBOW, 90° swivel	1
2	054-7480	TUBE, hydraulic	1
3	054-7324	ELBOW, 90° with port	1
4	054-3341-003	CONNECTOR, straight	2
5	058-3205-011	CONNECTOR, reducing	1
6	054-3237-013	ELBOW, 90° reducing	2
7	054-2988-010	ELBOW, 90° swivel	1
8	054-3341-008	CONNECTOR, straight	1
9	054-3341-007	CONNECTOR, straight	1
10	031-5601-003	DISCONNECT, quick – with cap	1

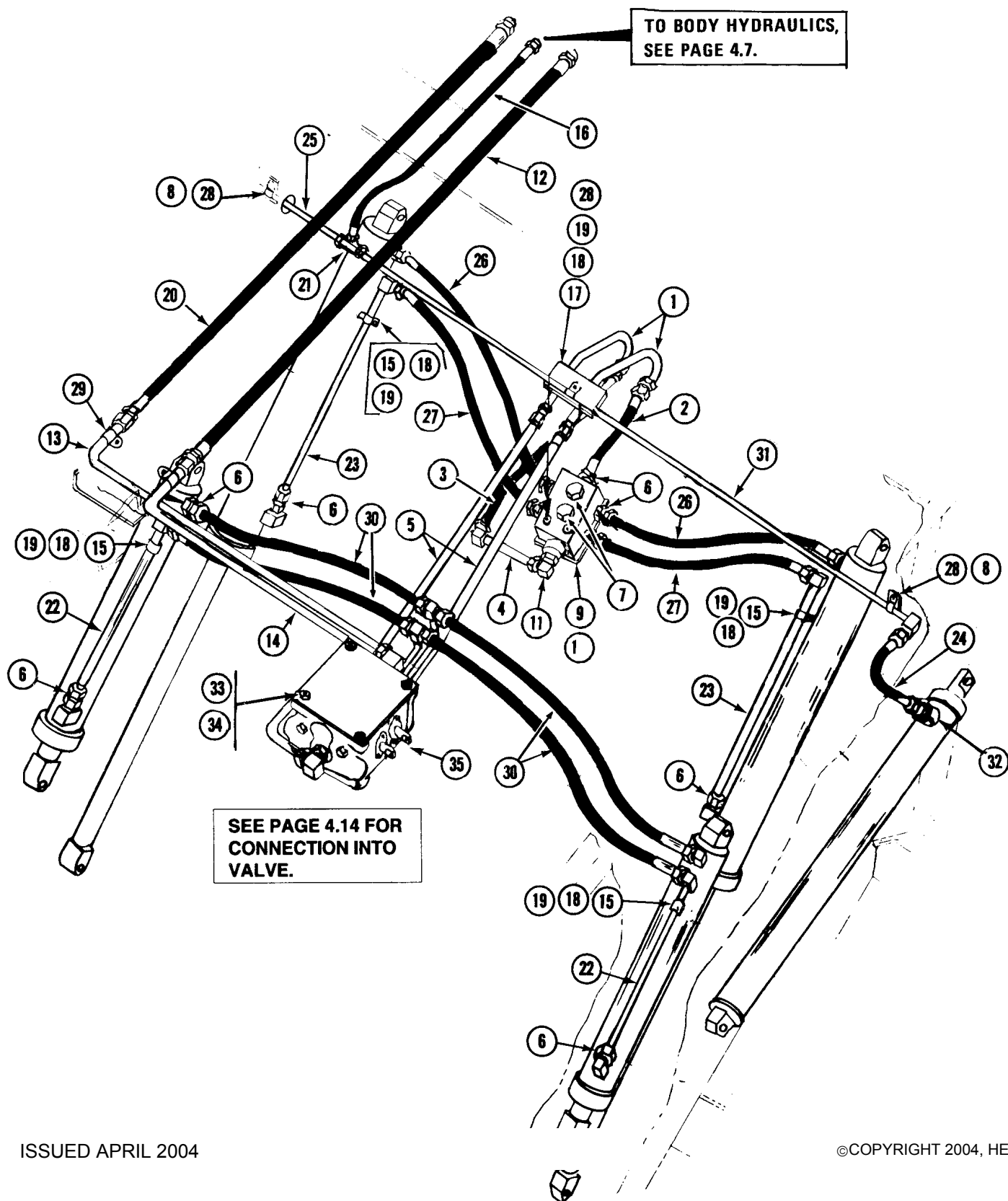
TAILGATE HYDRAULICS for UNITS WITHOUT REGENERATIVE VALVE



**TAILGATE HYDRAULICS for
UNITS WITHOUT REGENERATIVE VALVE**

REF	PART NO.	DESCRIPTION	REQ'D
1	057-1966-023	HOSE, hydraulic (84" wide units).....	2
	057-1966-029	HOSE, hydraulic (96" wide units).....	2
2	057-1966-024	HOSE, hydraulic (84" wide units).....	2
	057-1966-029	HOSE, hydraulic (96" wide units).....	2
3	036-1295-002	CLAMP, tube	10
4	036-1295-003	CLAMP, tube	3
5	054-4803	TUBE, hydraulic	1
6	054-4804	TUBE, hydraulic	1
7	057-2176-038	HOSE, hydraulic (11 thru 20 yd. units)	1
	057-2176-041	HOSE, hydraulic (25 yd. units).....	1
8	057-2179-055	HOSE, hydraulic (11 thru 20 yd. units)	2
	057-2179-058	HOSE, hydraulic (25 yd. units).....	2
9	054-4806	TUBE, hydraulic	1
10	057-1963-026	HOSE, hydraulic	1
11	054-3341-006	CONNECTOR	2
12	057-2177-055	HOSE, hydraulic (11 thru 20 yd. units)	1
	057-2177-058	HOSE, hydraulic (25 yd. units).....	1
13	054-7486	TUBE, hydraulic	1
14	177-2316	BRACKET, clamp	1
15	054-8331-002	TUBE, hydraulic (84" wide units)	1
	054-7487-002	TUBE, hydraulic (96" wide units)	1
16	054-4571-018	TUBE, hydraulic	2
17	QV5-FHFH-036	HOSE, hydraulic (84" wide units).....	4
	057-1964	HOSE, hydraulic (96" wide units).....	4
18	054-4571-023	TUBE, hydraulic	2
19	054-8329	TUBE, hydraulic (84" wide units)	1
	054-4807	TUBE, hydraulic (96" wide units)	1
20	054-3341-008	CONNECTOR	2
21	REF.	VALVE, tailgate control (see section 5)	1
22	054-3139-006	TEE	1
23	054-5466	CONNECTOR	2
24	FS070920	CAPSCREW – 3/8" – 16NC x 1"	10
25	FS230900	NUT, lock – 3/8" – 16NC	10
26	054-7388	TUBE, hydraulic	1
27	054-7387	TUBE, hydraulic	1
28	054-3341-008	CONNECTOR	10
29	057-1959	HOSE, hydraulic	1
30	054-5470	TUBE, hydraulic	1
31	054-3526-019	CONNECTOR	2
32	031-3305	VALVE, check	1
33	054-3340-003	ELBOW, 90°	1
34	054-5409	TUBE, hydraulic	1
35	036-1295-005	CLAMP, tube	1

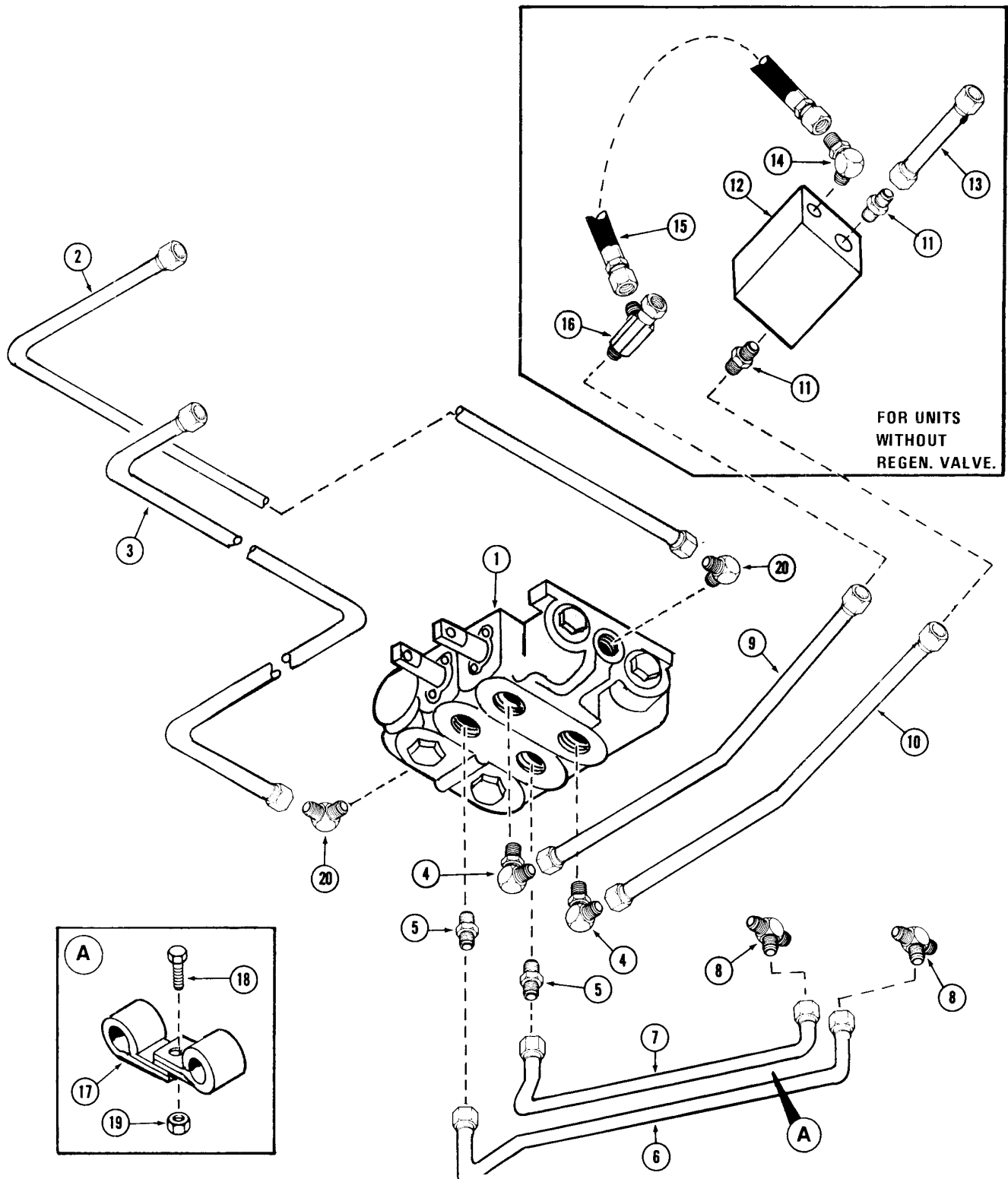
TAILGATE HYDRAULIC for UNITS WITH REGENERATIVE VALVE



**TAILGATE HYDRAULIC for
UNITS WITH REGENERATIVE VALVE**

REF	PART NO.	DESCRIPTION	REQ'D
1	054-5956	TUBE, hydraulic	2
2	057-1966-011	HOSE, hydraulic	1
3	057-1966-019	HOSE, hydraulic	1
4	054-5252	TUBE, hydraulic	1
5	054-7384	TUBE, hydraulic	2
6	054-3341-008	CONNECTOR	5
7	054-3342-008	PLUG	2
8	FS230900	NUT, lock – 3/8" – 16NC	A/R
9	REF.	VALVE, regenerative (see section 5)	1
10	077-9268	BRACKET, valve	1
11	054-2988-008	ELBOW, 90°	1
12	057-2177-055	HOSE, hydraulic (11 thru 20 yd. units)	2
	057-2177-058	HOSE, hydraulic (25 yd. units)	2
13	054-7486	TUBE, hydraulic	1
14	054-7487-002	TUBE, hydraulic	1
15	036-1295-002	CLAMP, tube	2
16	057-2176-038	HOSE, hydraulic (11 thru 20 yd. units)	1
	057-2176-041	HOSE, hydraulic (25 yd. units)	1
17	211-5488	SUPPORT, clamp (84" wide units)	1
	177-2316	BRACKET, clamp (96" wide units)	1
18	FS070920	CAPCREW – 3/8" – 16NC x 1"	A/R
19	FS230900	NUT, lock – 3/8" – 16NC	A/R
20	057-2195-055	HOSE, hydraulic (11 thru 20 yd units)	1
	057-2179-058	HOSE, hydraulic (25 yd units)	1
21	054-3139-006	TEE	1
22	054-4571-018	TUBE, hydraulic	2
23	054-4571-023	TUBE, hydraulic	2
24	057-1963-026	HOSE, hydraulic	2
25	054-4806	TUBE, hydraulic	1
26	QV5-FHFH-024	HOSE, hydraulic (84" wide units)	4
	QV5-FHFH-030	HOSE, hydraulic (96" wide units)	4
28	036-1295-003	CLAMP, tube	3
29	036-1295-005	CLAMP, tube – 1"	1
30	QV5-FHFH-036	HOSE, hydraulic (84" wide units)	1
	057-1964	HOSE, hydraulic (96" wide units)	1
31	054-8329	TUBE, hydraulic (84" wide units)	1
	054-4807	TUBE, hydraulic (96" wide units)	1
32	054-3341-006	CONNECTOR	2
33	FS071124	CAPSCREW – 1/2" – 13NC x 1-1/2"	2
34	FS231100	NUT, lock – 1/2" – 13NC	2
35	REF.	VALVE, tailgate control (see section 5)	1

TAILGATE CONTROL VALVE HYDRAULICS

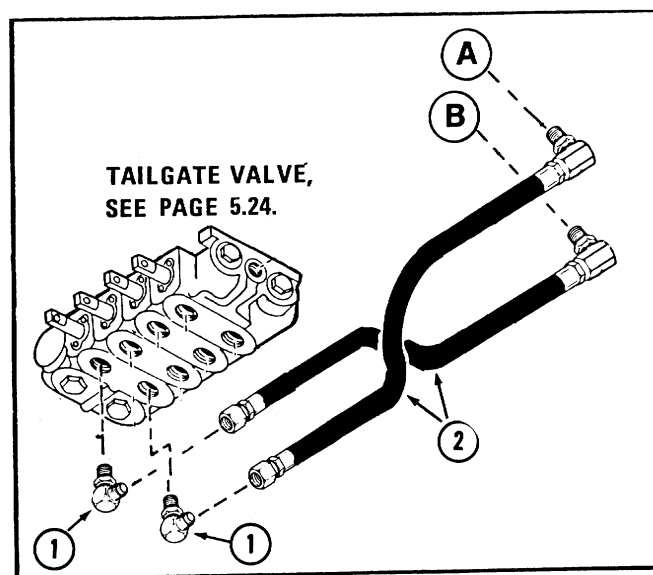
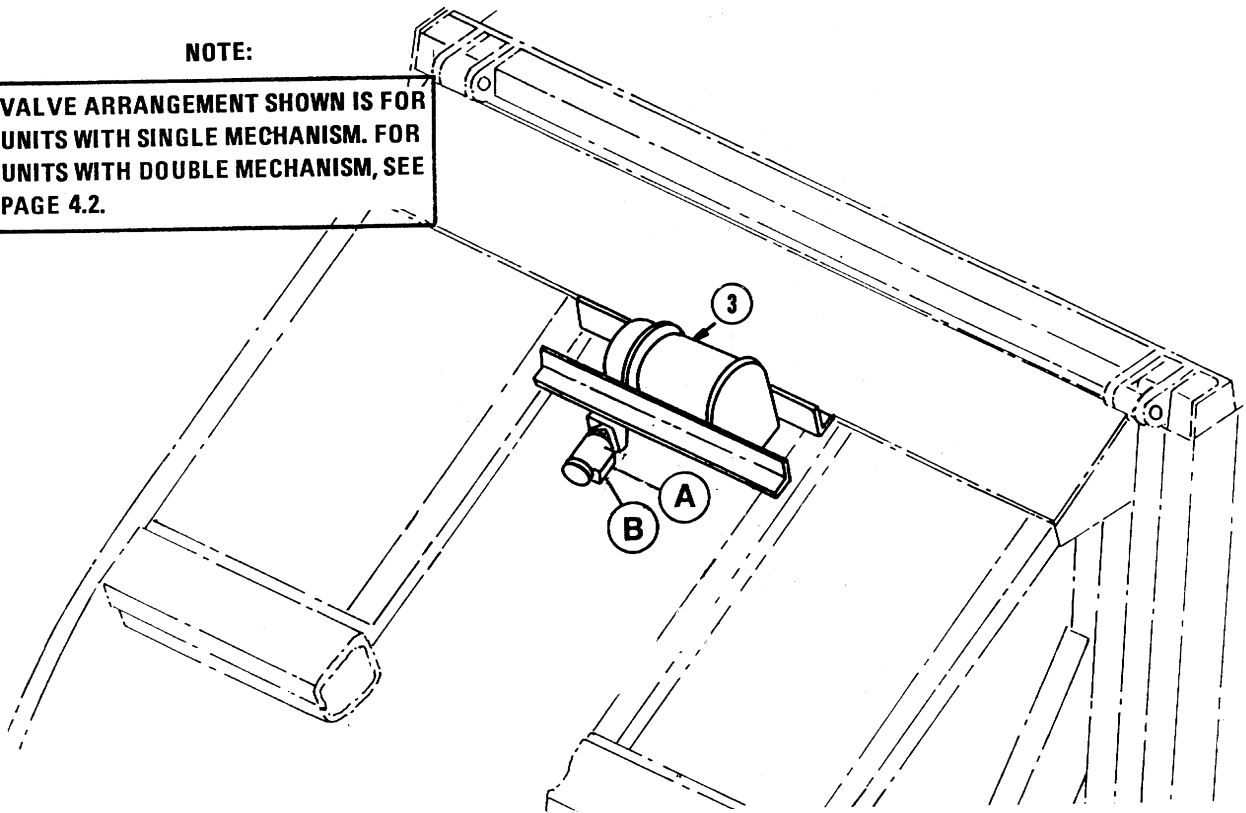


TAILGATE CONTROL VALVE HYDRAULICS

REF	PART NO.	DESCRIPTION	REQ'D
1	REF.	VALVE, tailgate control (see section 5)	1
2	054-8330	TUBE, hydraulic (84" wide units)	1
	054-7486	TUBE, hydraulic (96" wide units)	1
3	054-8331-002	TUBE, hydraulic (84" wide units)	1
	054-7487-002	TUBE, hydraulic (96" wide units w/single mech.)	1
	054-7487-004	TUBE, hydraulic (96" wide units w/double mech.)	1
4	054-3340-008	ELBOW, 90°	2
5	054-3341-008	CONNECTOR, straight	2
6	054-9338	TUBE, hydraulic (84" wide units)	1
	054-7382	TUBE, hydraulic (96" wide units)	1
7	054-9339	TUBE, hydraulic (84" wide units)	1
	054-7383	TUBE, hydraulic (96" wide units)	1
8	054-3139-008	TEE	2
9	054-7388	TUBE, hydraulic (for standard units)	1
	054-7384	TUBE, hydraulic (for regen valve units)	1
10	054-9370	TUBE, hydraulic (for standard 84" wide units)	1
	054-7387	TUBE, hydraulic (for standard 96" wide units)	1
	054-7384	TUBE, hydraulic (for regen valve units)	1
11	054-3526-019	CONNECTOR	2
12	031-3305	VALVE, check	1
13	054-5409	TUBE, hydraulic	1
14	054-3340-003	ELBOW, 90°	1
15	057-1959	HOSE, hydraulic	1
16	054-5470	TUBE, hydraulic	1
17	036-1295-002	CLAMP, tube	A/R
18	FS070920	CAPSCREW – 3/8" – 16NC x 1"	A/R
19	FS230900	NUT, lock – 3/8" – 16NC	A/R
20	054-3340-010	ELBOW, 90°	2

WINCH MECHANISM HYDRAULICS**NOTE:**

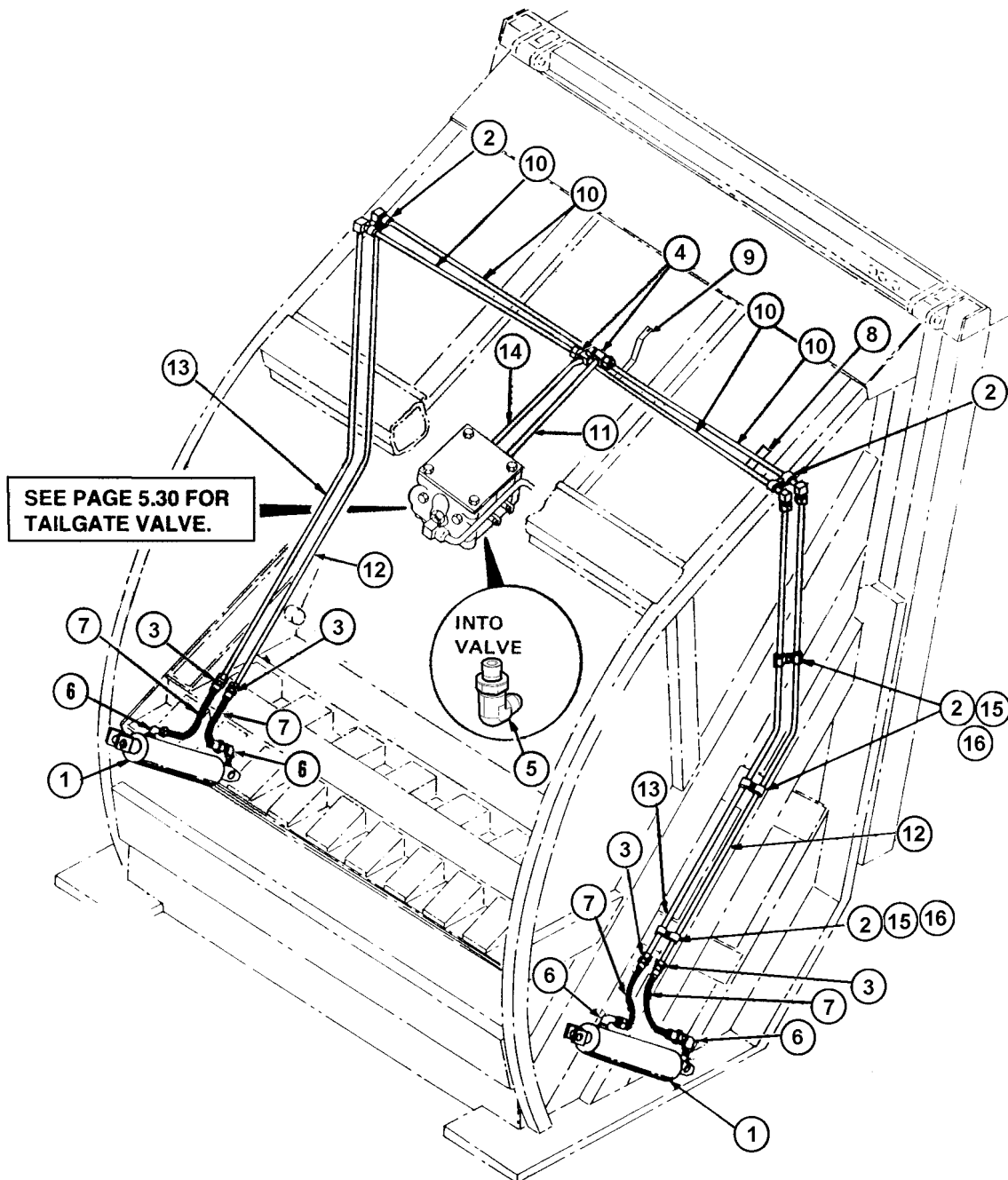
VALVE ARRANGEMENT SHOWN IS FOR
UNITS WITH SINGLE MECHANISM. FOR
UNITS WITH DOUBLE MECHANISM, SEE
PAGE 4.2.



WINCH MECHANISM HYDRAULICS

REF	PART NO.	DESCRIPTION	REQ'D
1	054-3237-019	ELBOW, 90°	2
2	057-1509-034	HOSE, hydraulic	2
3	REF.	WINCH ASSEMBLY – (See Section 5)	1
4	058-3205-019	ADAPTER	2

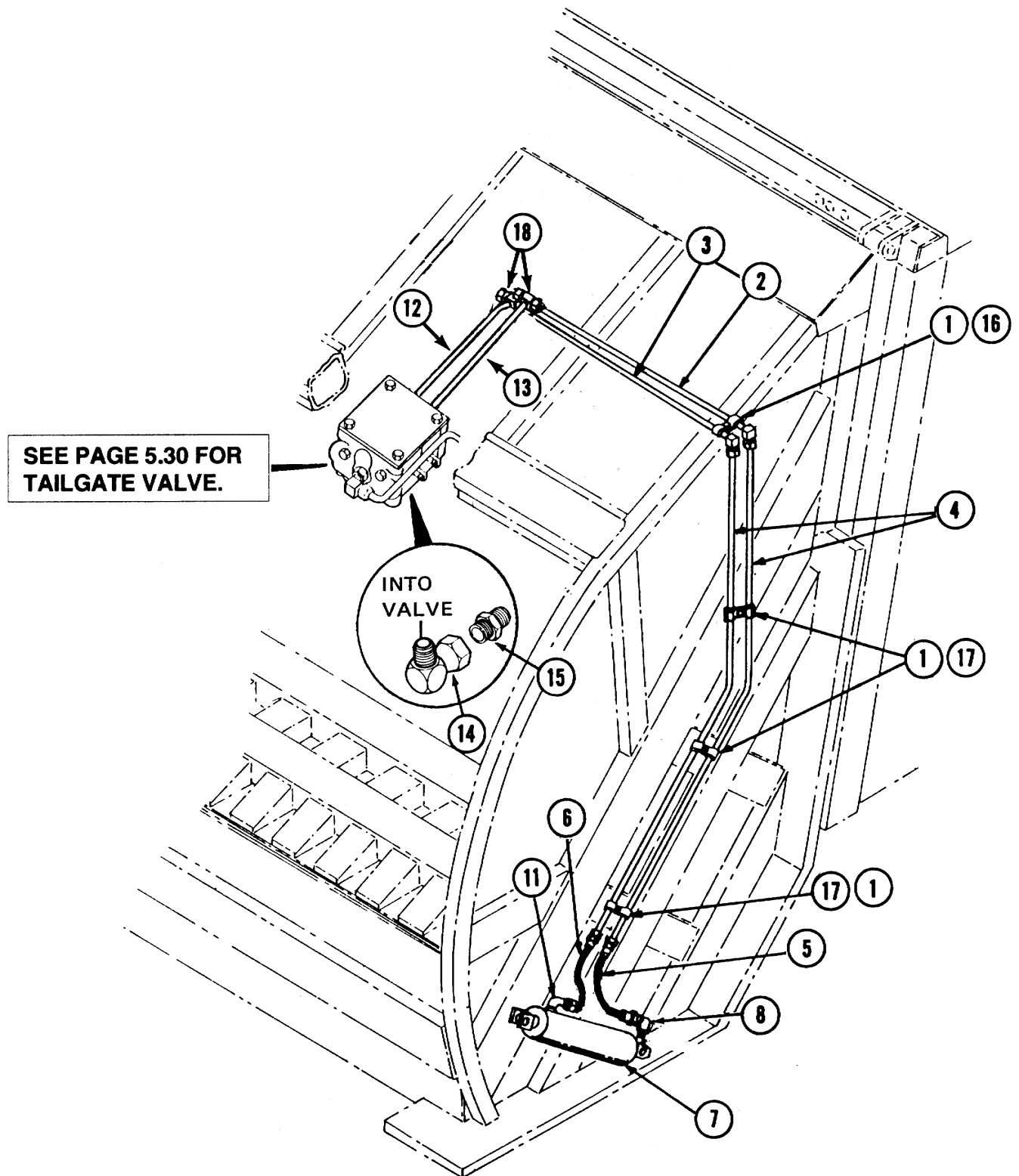
ARM OR ROLL BAR MECHANISM HYDRAULICS



ARM OR ROLL BAR MECHANISM HYDRAULICS

REF	PART NO.	DESCRIPTION	REQ'D
1	REF.	CYLINDER, container dump – (see Section 5)	2
2	036-1122-006	CLAMP, tube 3/8"	14
3	054-3007-005	UNION, tube to tube 3/8"	4
4	054-3139-005	TEE, 3/8" JIC male	2
5	054-3237-009	ELBOW, reducer 3/8" tube to 3/4" o-ring	2
6	054-3340-005	ELBOW, male – tube to o-ring 3/8"	4
7	057-2168-022	HOSE, hydraulic	4
8	077-7707	TUBE, hydraulic	4
9	177-5075	BRACKET, tube support	1
10	354-2054	TUBE, hydraulic	4
11	354-2055	TUBE, hydraulic	1
12	354-2056	TUBE, hydraulic	2
13	354-2057	TUBE, hydraulic	2
14	354-2058	TUBE, hydraulic	1
15	FS070815	CAPSCREW, hex. 5/16"-18NC x 3/4"	7
16	FS230800	NUT, lock 5/16"-18NC	7

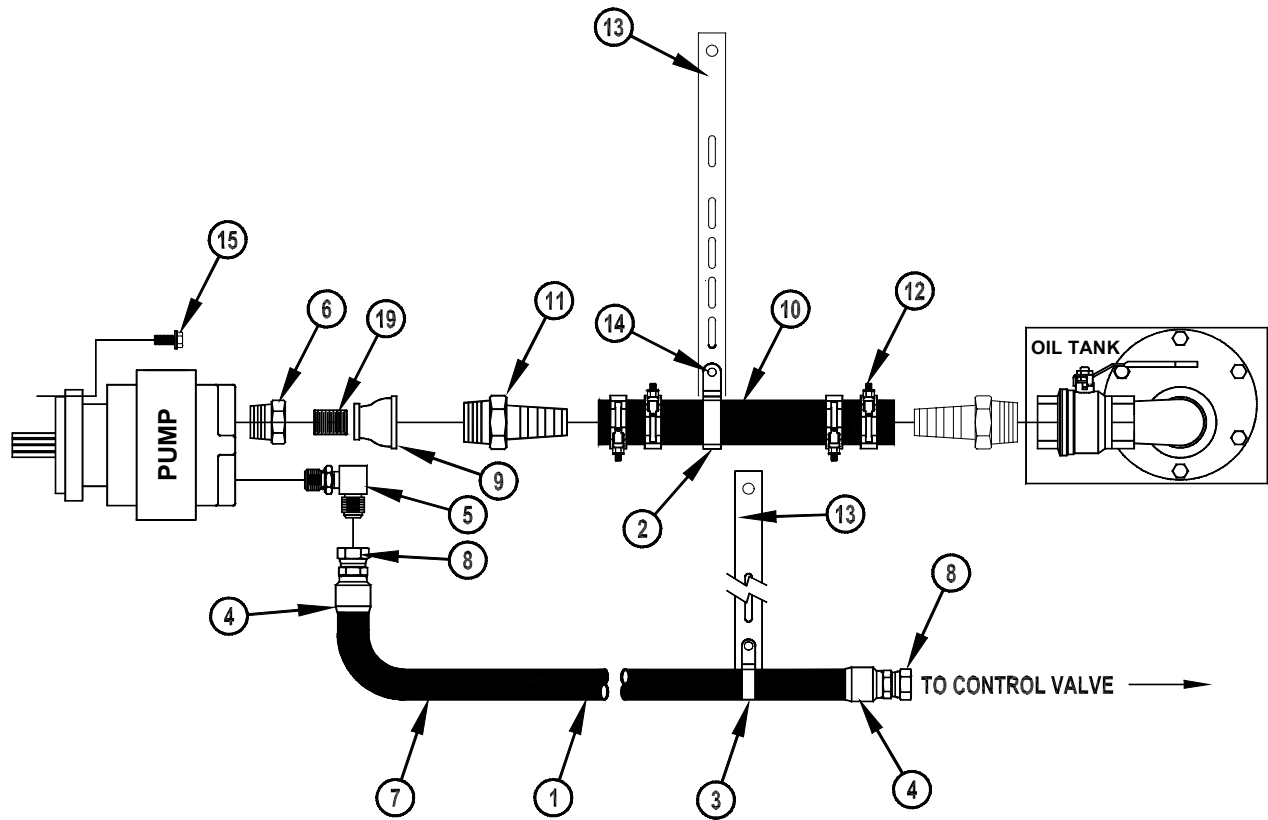
GRAB BAR FLIPPER MECHANISM HYDRAULICS



GRAB BAR FLIPPER MECHANISM HYDRAULICS

REF	PART NO.	DESCRIPTION	REQ'D
1	036-1122-006	CLAMP, tube	A/R
2	054-5022-003	TUBE, hydraulic	1
3	054-5022-002	TUBE, hydraulic	1
4	054-5020	TUBE, hydraulic	2
5	057-2168-022	HOSE, hydraulic	2
6	054-3542-005	CAP	2
7	REF.	CYLINDER, grab bar – (See Section 5)	1
8	054-9455	TUBE, hydraulic	1
9	054-9456	TUBE, hydraulic	1
10	054-2988-006	ELBOW, 90°	1
11	054-3932	CONNECTOR	1
12	FS070720	CAPSCREW – 1/4" – 20NF x 1"	2
	FS230700	NUT, lock – 1/4" – 20NF	2
13	FS100913	CAPSCREW – 3/8" – 24NF x 5/8"	6
	FS540900	WASHER, lock – 3/8"	6

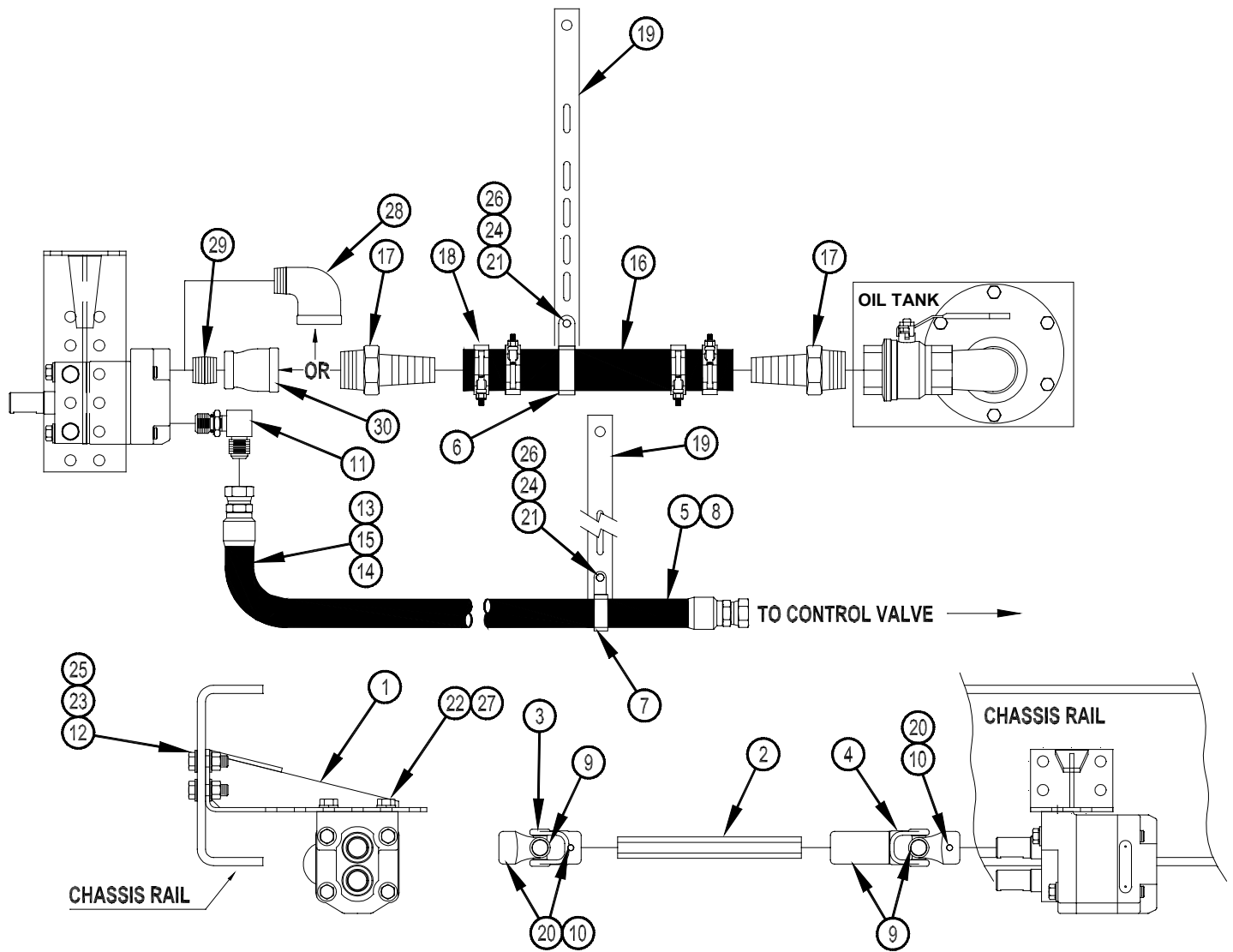
DIRECT MOUNT PUMP KIT 272-2623



**DIRECT MOUNT PUMP KIT
272-2623**

REF	PART NO.	DESCRIPTION	REQ'D
1	035-2727	GUARD, fiber	14ft
2	036-1295-007	CLAMP – 2-7/16"	4
3	036-1478	CLAMP	7
4	036-1499	CLAMP, bandit	2
5	054-3237-007	ELBOW, 90° reducing	1
6	054-4194-010	ADAPTER, female	1
7	057-1719-005	HOSE, hydraulic – w/reuseable ends	1
8	057-1719-010	FITTING, hose	2
9	FS933023	REDUCER, bell – 1-1/4"	1
10	057-2172	HOSE, hydraulic – suction 2"	12ft
11	058-8579-006	FITTING, suction hose	2
12	074-4498-032	CLAMP, sluction hose	4
13	211-9851	BRACKET, hose support	10
14	FS070920	CAPSCREW – 3/8" – 16NC x 1"	11
	FS520900	WASHER, flat – 3/8"	22
	FS230900	NUT, lock – 3/8" – 16NC	11
15	FS071122	CAPSCREW – 1/2" – 13NC x 1-1/4"	4
	FS541100	WASHER, lock – 1/2"	4
16	FS882200	NIPPLE, close – 1-1/4"	1

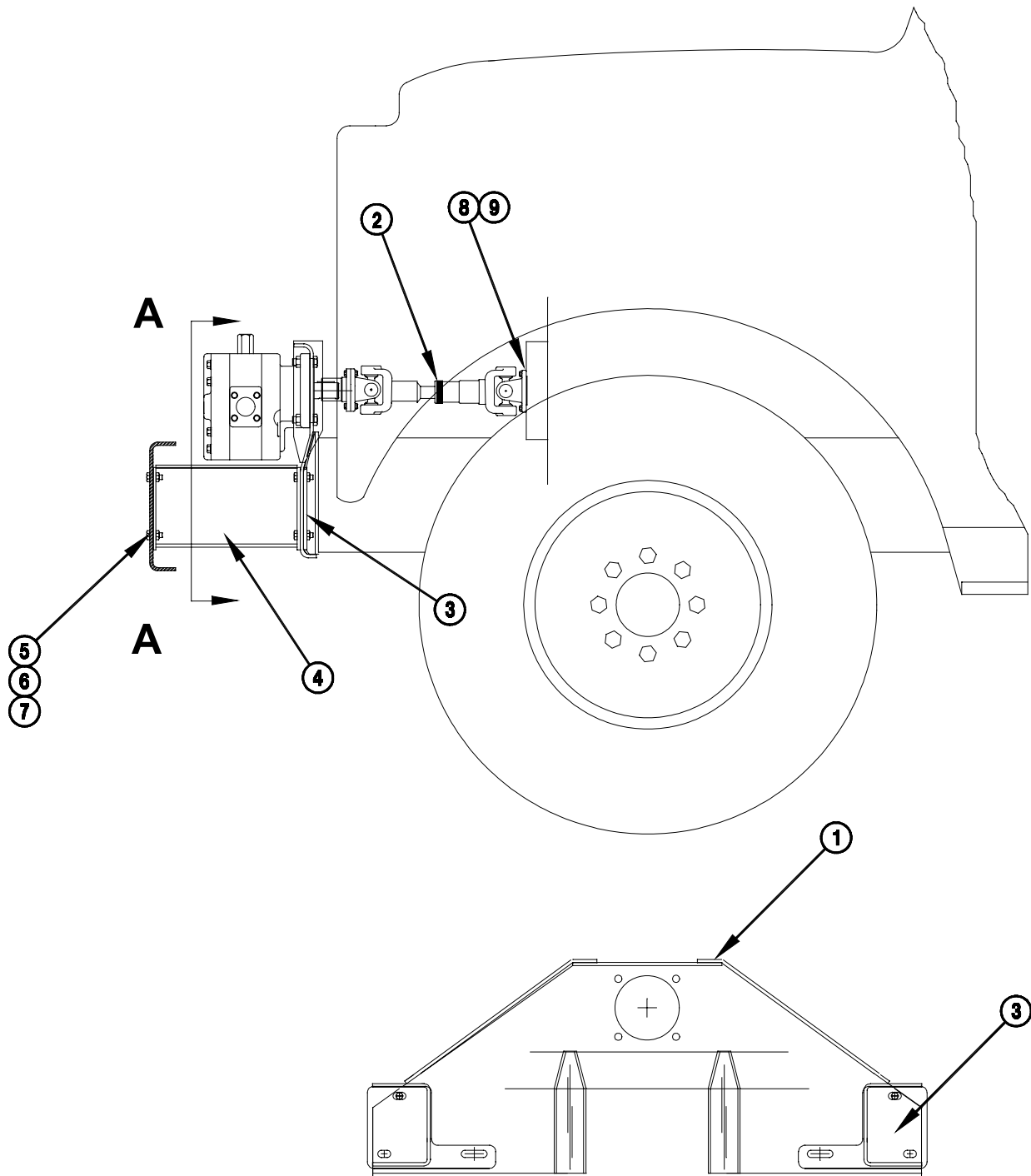
PTO – PUMP DRIVE KIT 272-1870



FORMULA 4000**PTO – PUMP DRIVE KIT
272-1870**

REF	PART NO.	DESCRIPTION	REQ'D
1	011-4049	BRACKET, pump	1
2	008-8111	SHAFT, drive	1
3	030-0586	JOINT, universal	1
4	030-0587	JOINT, universal	1
5	035-2727	GUARD, fiber	7ft
6	036-1295-007	CLAMP – 2-7/16"	1
7	036-1478	CLAMP	2
8	036-1499	CLAMP, bandit	2
9	042-1356	CAP, grease fitting	4
10	047-1088	SETSCREW	3
11	054-3237-002	ELBOW, 90°	1
12	055-1391-007	WASHER, hardened	8
13	057-1719-005	END, pressure hose reuseable (shipper units)	1
14	057-1719-10	FITTING, pressure hose	2
15	057-1719	HOSE, pressure – (bulk)	7ft
16	057-2172	HOSE, suction – 2"	6ft
17	058-8579-006	FITTING, suction hose	2
18	074-4498-032	CLAMP, suction hose	4
19	211-9851	SUPPORT, bracket	2
20	263-0042	WIRE, lock	2
21	FS070920	CAPSCREW – 3/8" – 16NC x 1"	3
22	FS071322	CAPSCREW – 5/8" – 11NC x 1-1/4"	2
23	FS071330	CAPSCREW – 5/8" – 11NC x 2"	4
24	FS230900	NUT, lock – 3/8" – 16NC	3
25	FS231300	NUT, lock – 5/8" – 11NC	4
26	FS520900	WASHER, flat – 3/8"	6
27	FS541300	WASHER, lock – 5/8"	2
28	FS853024	ELBOW, 90° reducing street	1
29	FS882400	NIPPLE, close – 1-1/2"	1
30	FS933024	REDUCER, bell – 2" x 1-1/2"	1

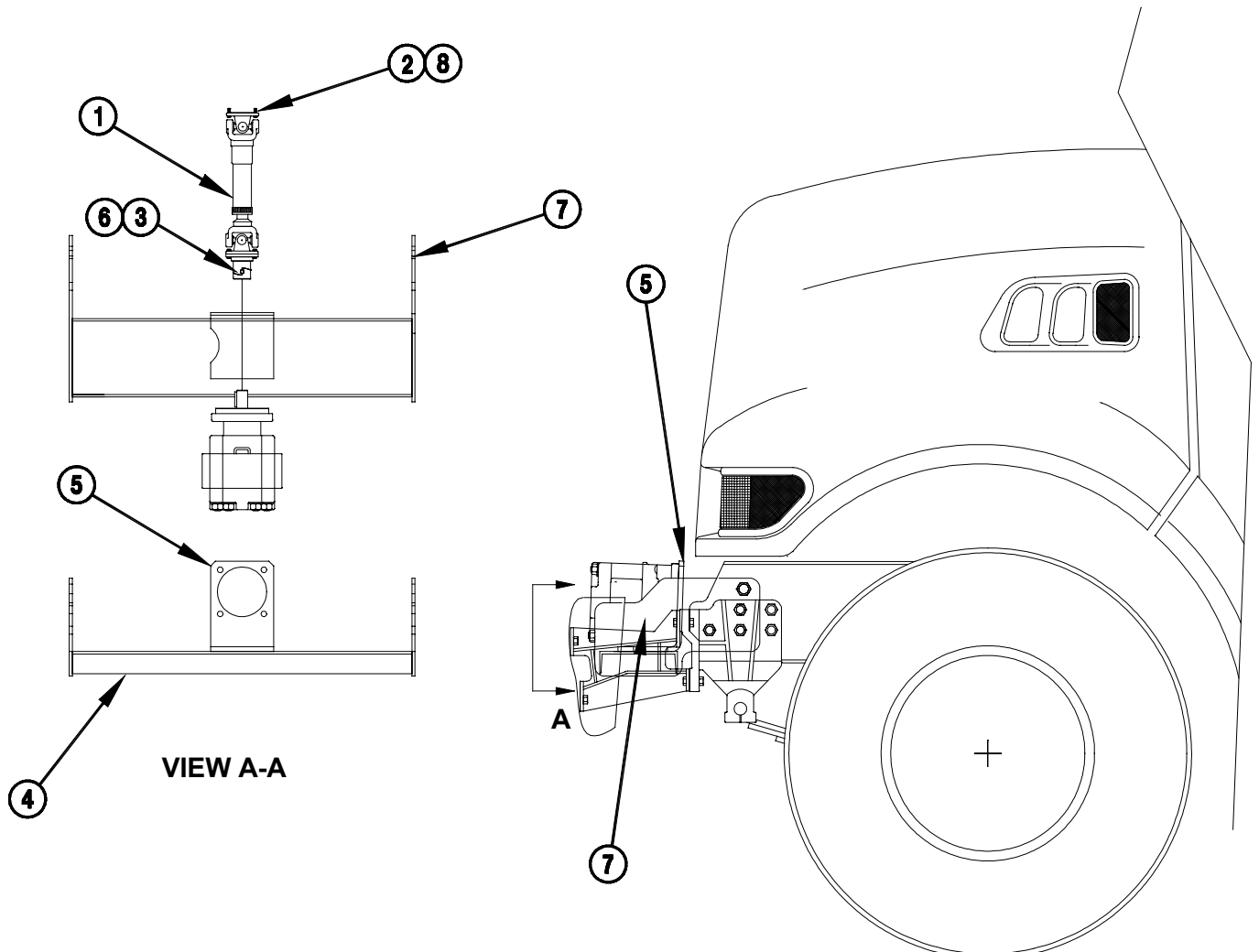
PUMP MOUNT KIT for FORD L SERIES CHASSIS
272-5859



**PUMP MOUNT KIT for FORD L SERIES CHASSIS
272-5859**

REF	PART NO.	DESCRIPTION	REQ'D
1	211-4970	BRACKET, pump	1
2	030-0705-009	DRIVE LINE	1
3	177-2262	BRACE	6
4	272-5859-001	CHANNEL	2
5	FS071122	CAPSCREW – 1/2" – 13NC x 1-1/4"	12
6	FS231100	NUT, lock – 1/2" – 13NC	12
7	FS511000	WASHER, flat – 1/2"	12
8	047-1794	CAPSCREW – 7/16" – 20NC x 1"	4
9	FS551000	WASHER, lock - 7/16"	4

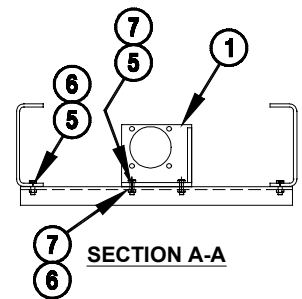
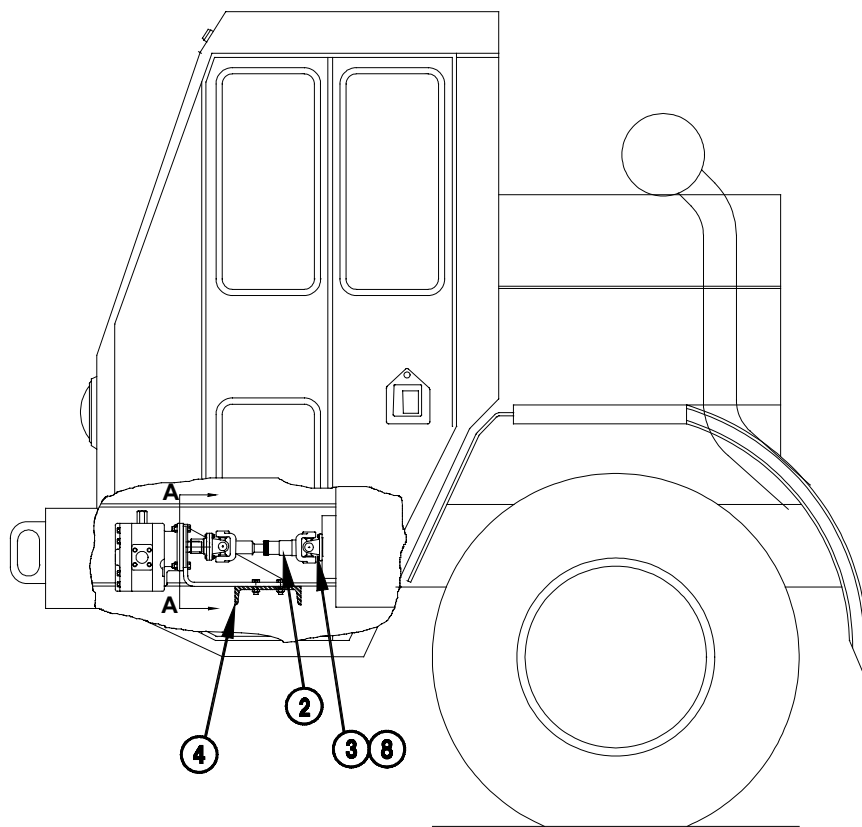
**PUMP MOUNT KIT for FORD LOUISVILLE CHASSIS
272-8418**



**PUMP MOUNT KIT for FORD LOUISVILLE CHASSIS
272-8418**

REF	PART NO.	DESCRIPTION	REQ'D
1	030-0705-009	DRIVE LINE	1
2	047-1794	CAPSCREW – 7/16" - 20NC x 1"	4
3	047-2193	SETSCREW	2
4	177-2070	CHANNEL, pump support.....	1
5	211-3298	BRACKET, pump	1
6	263-0042	WIE, lock	1
7	311-0210	BRACKET, pump	2
8	FS511000	WASHER, lock – 7/16"	4

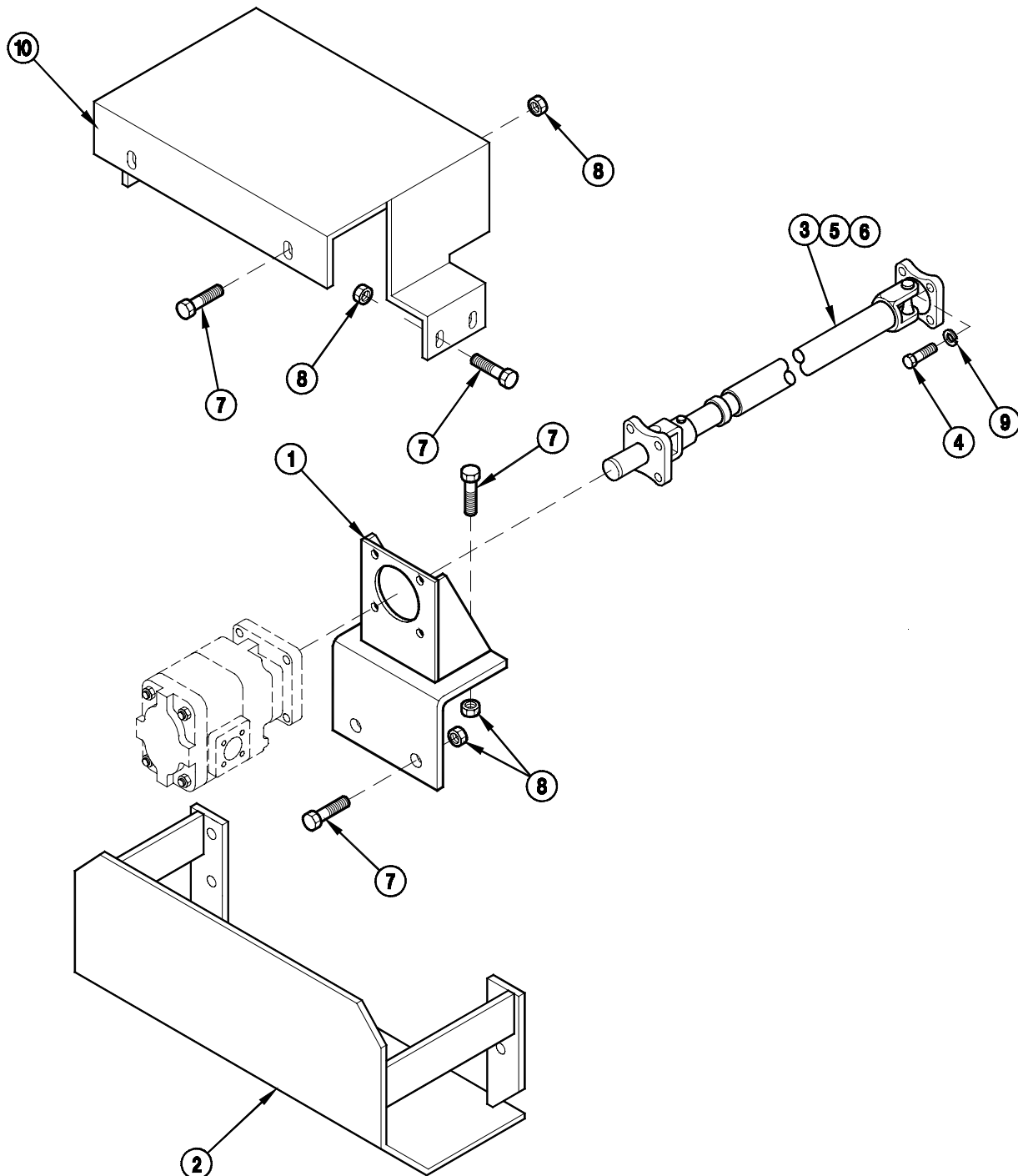
PUMP MOUNT KIT for CRANE CARRIER CHASSIS **272-5860**



**PUMP MOUNT KIT for CRANE CARRIER CHASSIS
272-5860**

REF	PART NO.	DESCRIPTION	REQ'D
1	211-4033	BRACKET, pump	1
2	030-0617	DRIVE LINE	1
3	047-1794	CAPSCREW – 7/16 – 20NF x 1"	4
4	177-2407	SUPPORT pump bracket	1
5	FS071122	CAPSCREW – 1/2" – 13NC x 1-1/4"	8
6	FS231100	NUT, lock – 1/2" – 13NC	12
7	FS511100	WASHER, flat – 1/2"	8
8	FS551000	WASHER, lock – 7/16"	4

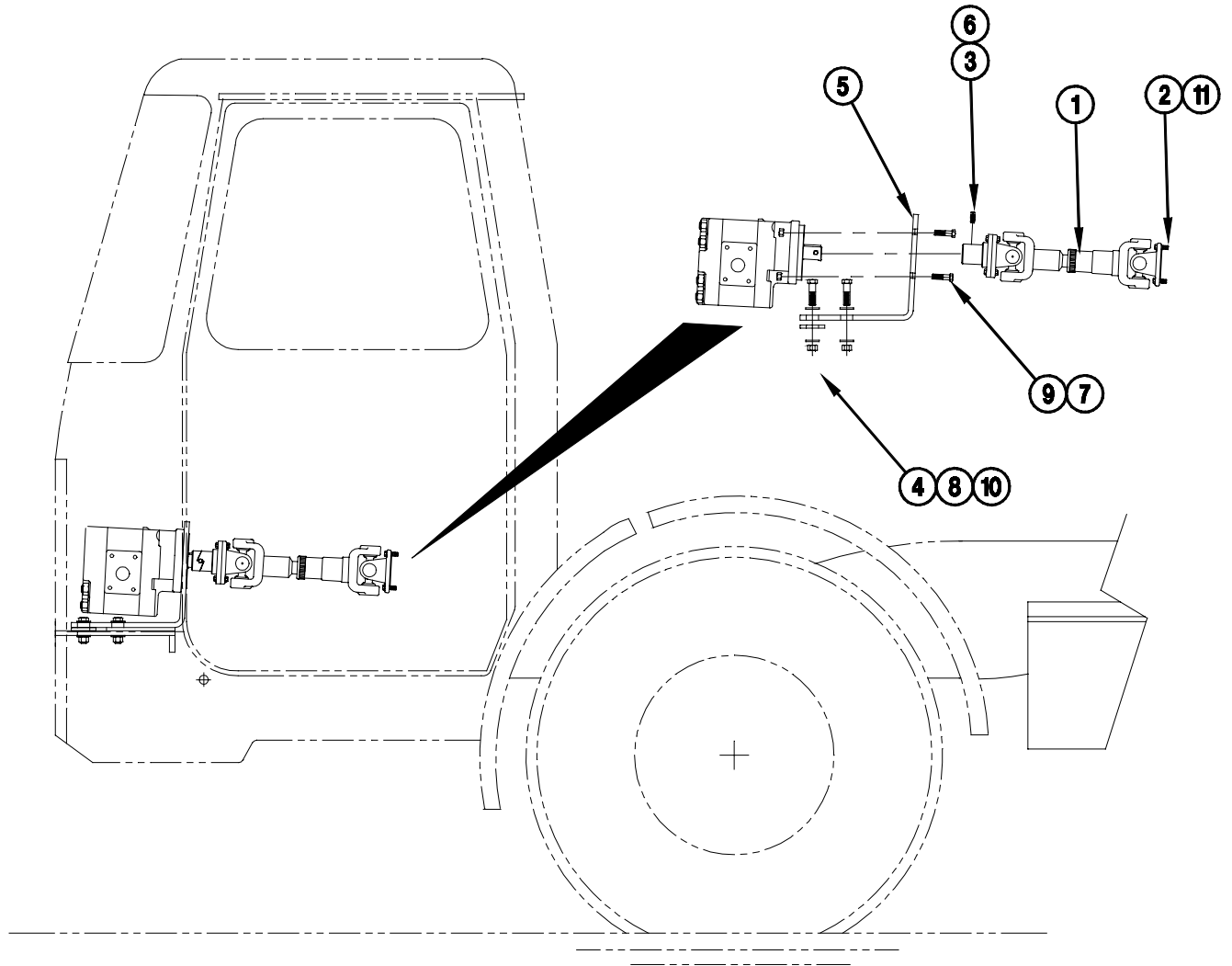
PUMP MOUNT KIT for WX VOLVO CHASSIS
272-5090 – WITHOUT PUMP COVER
272-5090-01 – WITH PUMP COVER



**PUMP MOUNT KIT for WX VOLVO CHASSIS
272-5090 – WITHOUT PUMP COVER
272-5090-01 – WITH PUMP COVER**

REF	PART NO.	DESCRIPTION	REQ'D
1	112-8335	COVER, pump	1
2	211-5511	GUARD, pump	1
3	211-3272	BRACKET, pump mounting	1
4	FS231100	NUT, lock – 1/2" – 13NC	A/R
5	FS071124	CAPSCREW – 1/2" – 13NC x 1-1/2"	A/R
6	030-0705-005	DRIVE LINE	1
7	047-2193	SETSCREW	2
8	263-0042	WIRE, lock	1
9	047-1794	BOLT, drive line	4
10	FS551000	WASHER, lock – 7/16"	4
11	FS190400	FITTING, grease	1

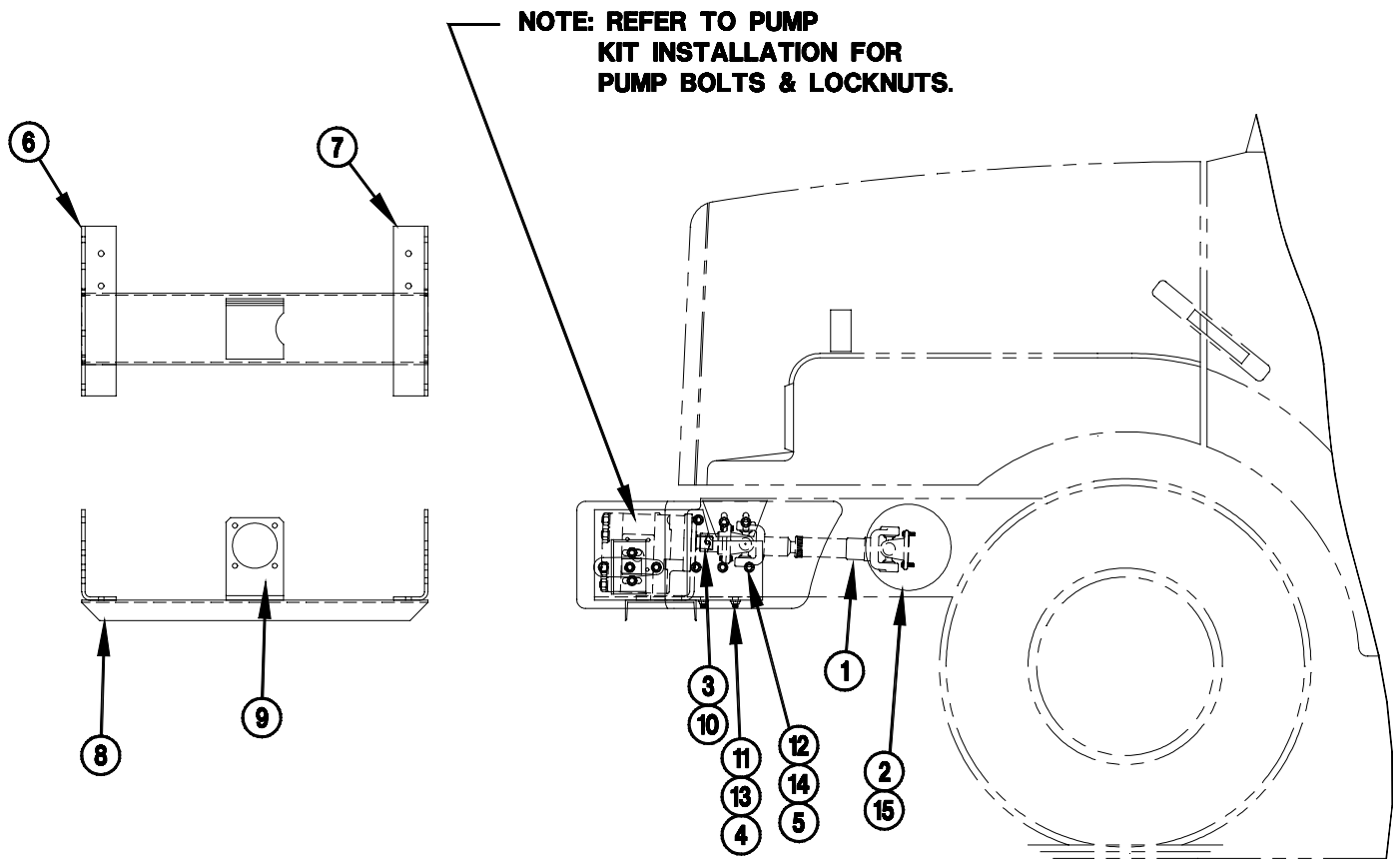
FRONT MOUNT KIT for WXLL VOLVO CHASSIS
272-8016



**FRONT MOUNT KIT for WXLL VOLVO CHASSIS
272-8016**

REF	PART NO.	DESCRIPTION	REQ'D
1	030-0705-004	DRIVE LINE	1
2	047-1794	BOLT, drive line.....	4
3	047-2193	SETSCREW	2
4	055-1391-007	WASHER, flat – 5/8"	8
5	211-4792	BRACKET, pump	1
6	263-0042	LOCKWIRE	1
11	FS071130	CAPSCREW – 1/2" – 13NC x 2"	4
12	FS081332	CAPSCREW – 5/8" – 11NC x 2-1/4"	4
13	FS231100	NUT, lock – 1/2" – 13NC	4
14	FS231300	NUT, lock – 5/8" – 11NC	4
15	FS551000	WASHER, lock – 7/16"	4

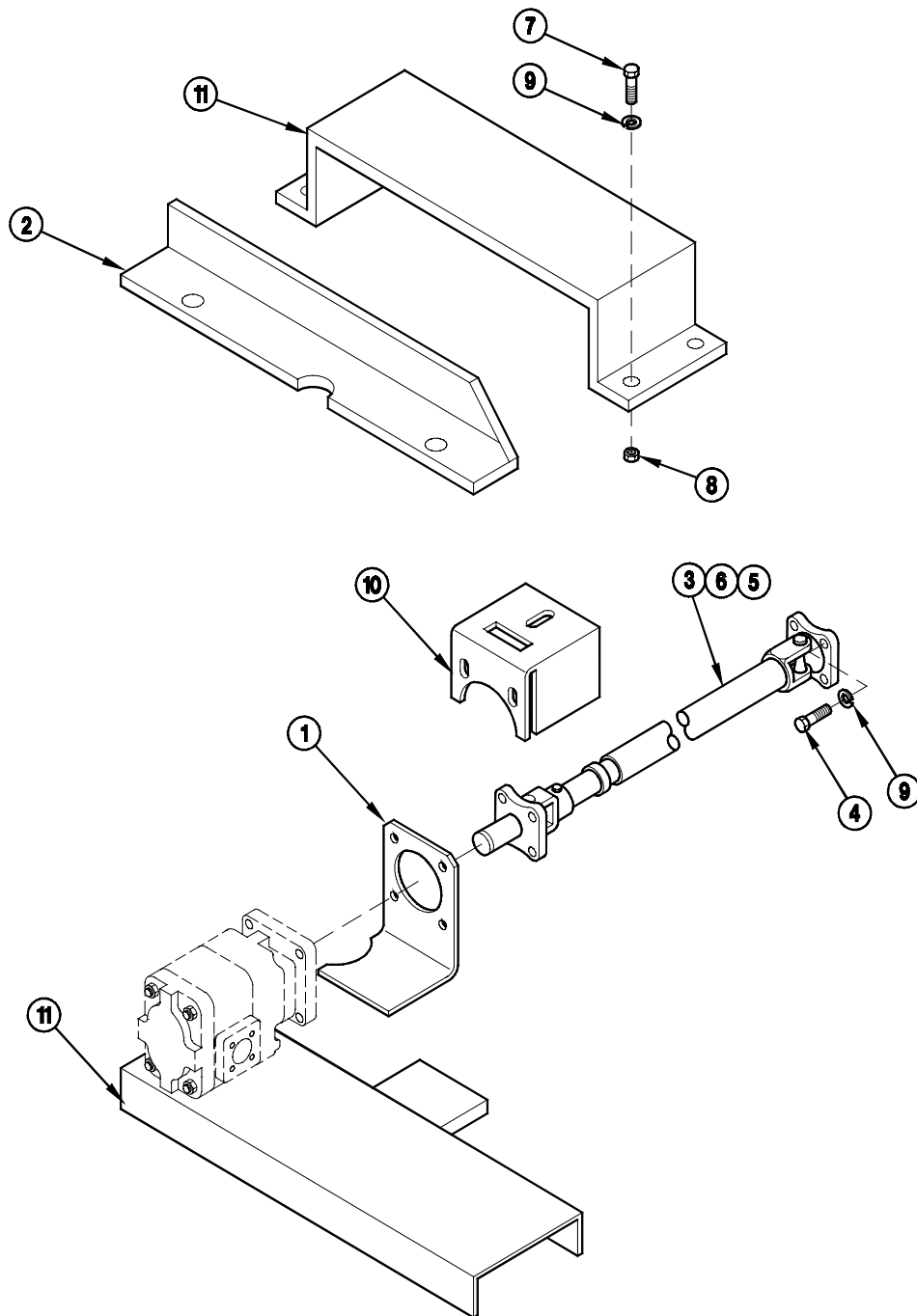
FRONT MOUNT KIT for WG VOLVO CHASSIS
272-8024



**FRONT MOUNT KIT for WG VOLVO CHASSIS
272-8024**

REF	PART NO.	DESCRIPTION	REQ'D
1	030-0705-006	DRIVE LINE	1
2	047-1794	BOLT, drive line.....	4
3	047-2193	SETSCREW	2
4	055-1391-005	WASHER, flat – 1/2"	8
5	055-1391-007	WASHER, flat – 5/8"	12
6	080-1604-001	EXTENSION, bumper – right hand.....	1
7	080-1604-002	EXTENSION, bumper – left hand.....	1
8	177-4000	SUPPORT, pump.....	1
9	211-3298	BRACKET, pump	1
10	263-0042	LOCKWIRE	1
11	FS081132	CAPSCREW – 1/2" – 13NC x 2-1/4"	4
12	FS081334	CAPSCREW – 5/8" – 11NC x 2-1/2"	6
13	FS231100	NUT, lock – 1/2" – 13NC	4
14	FS231300	NUT, lock – 5/8" – 11NC	6
15	FS551000	WASHER, lock – 7/16"	4

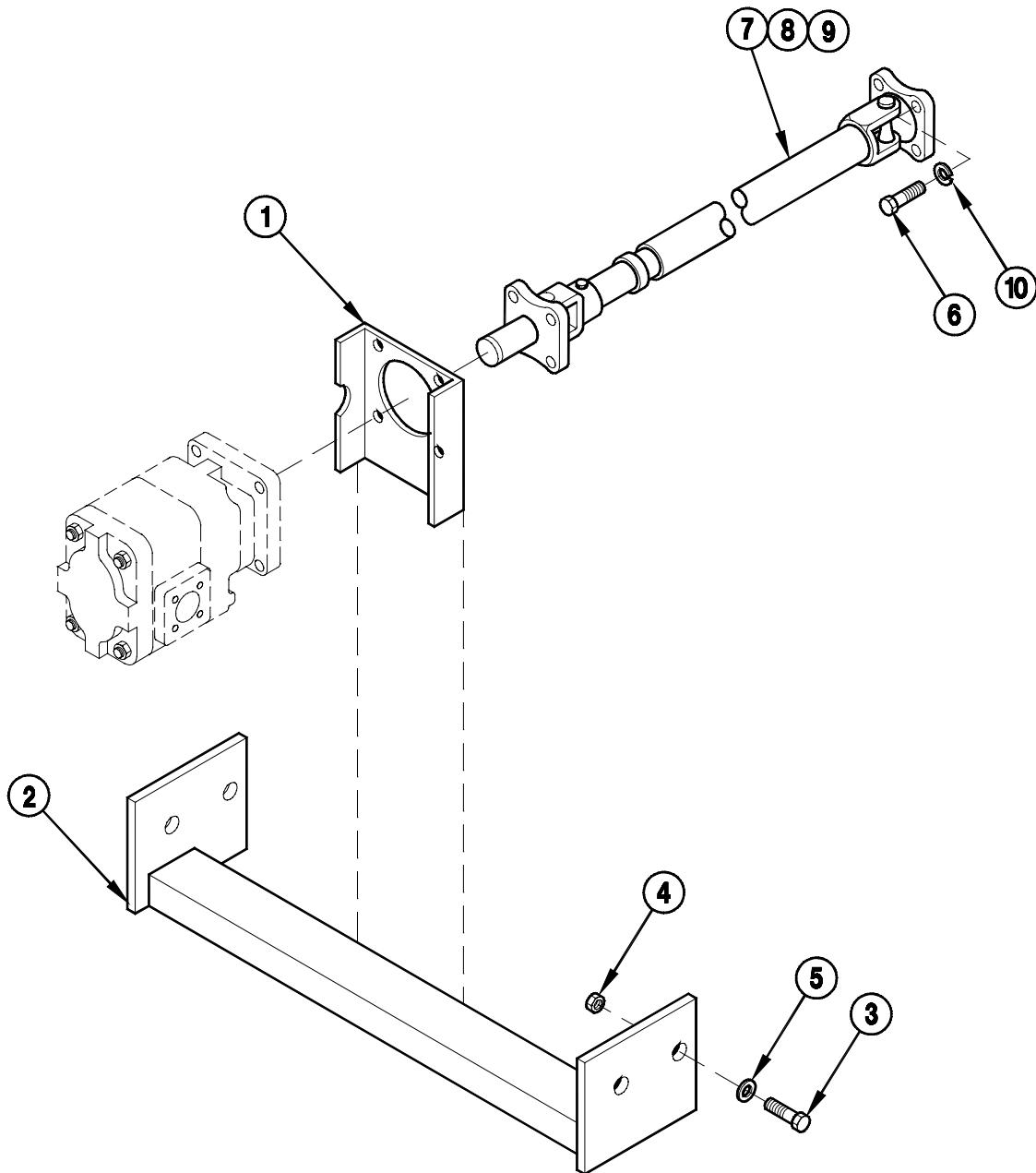
PUMP MOUNT KIT for MR MACK CHASSIS
272-3460



**PUMP MOUNT KIT for MR MACK CHASSIS
272-3460**

REF	PART NO.	DESCRIPTION	REQ'D
1	211-3298	BRACKET, pump mounting	1
2	035-2592	GUARD, pump	1
3	030-705-003	DRIVE LINE	1
4	047-1794	CAPSCREW – 7/16 – 20NF x 1"	4
5	047-2193	SETSCREW	2
6	263-0042	WIRE, lock	1
7	FS071122	CAPSCREW – 1/2" – 13NC x 1"	A/R
8	FS231100	NUT, lock – 1/2" – 13NC	A/R
9	FS551000	WASHER, lock – 7/16"	4
10	211-6917	COVER, pump	1
11	112-9882	PANEL, cover	1
12	177-3999	SUPPORT, bracket	1

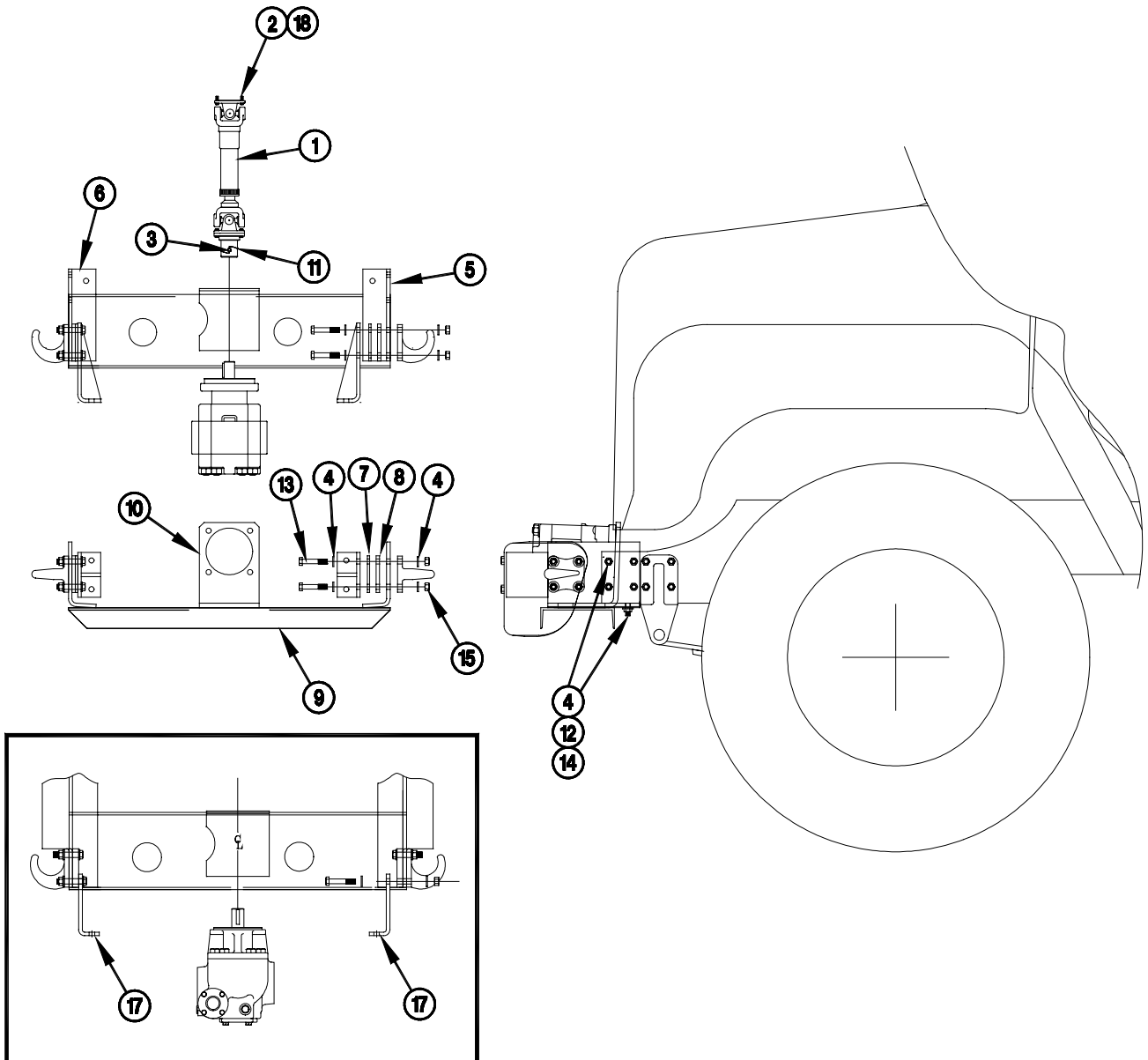
MOUNT KIT for KENWORTH/PETERBILT CHASSIS
272-6486



**MOUNT KIT for KENWORTH/PETERBILT CHASSIS
272-6486**

REF	PART NO.	DESCRIPTION	REQ'D
1	211-6916	BRACKET, pump	1
2	272-6486-001	BRACKET, pump support.....	1
3	FS071560	CAPSCREW – 3/4" – 10NC x 5"	4
4	FS231500	NUT, lock – 3/4" – 10NC	4
5	055-1391-008	WASHER, flat – 3/4"	8
6	047-1794	CAPSCREW – 7/16" – 20NF x 1"	4
7	047-2193	SETSCREW	2
8	030-0705-006	DRIVE LINE	1
9	263-0042	WIRE, lock	1
10	FS551000	WASHER, lock – 7/16"	4

PUMP MOUNT KIT for NAVISTAR CHASSIS
272-8040 – WITHOUT EXT. BUMPER
272-8040-001 – WITH EXT. BUMPER

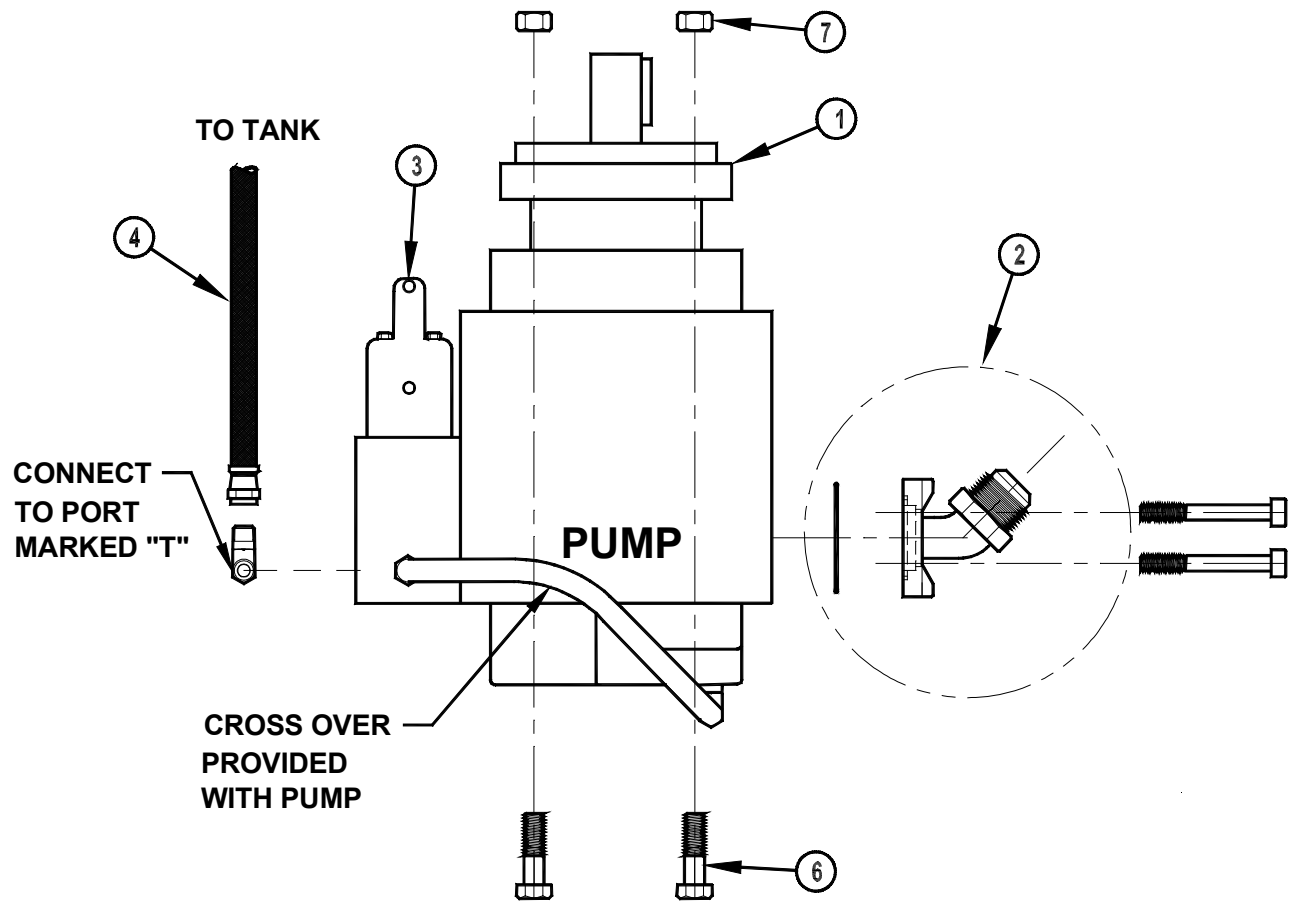


FORMULA 4000

PUMP MOUNT KIT for NAVISTAR CHASSIS
272-8040 – WITHOUT EXT. BUMPER
272-8040-001 – WITH EXT. BUMPER

REF	PART NO.	DESCRIPTION	REQ'D
1	030-0705-009	DRIVE LINE	1
2	047-1794	CAPSCREW – 7/16" – 20NC x 1"	4
3	047-2193	SETSCREW	2
4	055-1391-005	WASHER, flat hardened	36
5	080-1605-001	EXTENSION, bumper – left hand	1
6	080-1605-002	EXTENSION, bumper – right hand	1
7	080-1605-003	SPACER – 1/4"	2
8	080-1605-004	SPACER – 3/8"	2
9	177-4450	SUPPORT, pump	1
10	211-3298	BRACKET, pump	1
11	263-0042	WIRE, lock	1
12	FS071130	CAPSCREW – 1/2" – 13NC x 2"	10
13	FS111136	CAPSCREW – 1/2" – 20NF x 2-3/4"	4
14	FS231100	NUT, lock – 1/2" – 13NC	10
15	FS241100	NUT, lock – 1/2" – 20NF	4
16	FS551000	WASHER, lock – 7/16"	4
17	311-0107	BRACKET, bumper extension (for 272-8040-01 kit)	2

FRONT MOUNT PUMP KIT with OVERSPEED **272-5855**

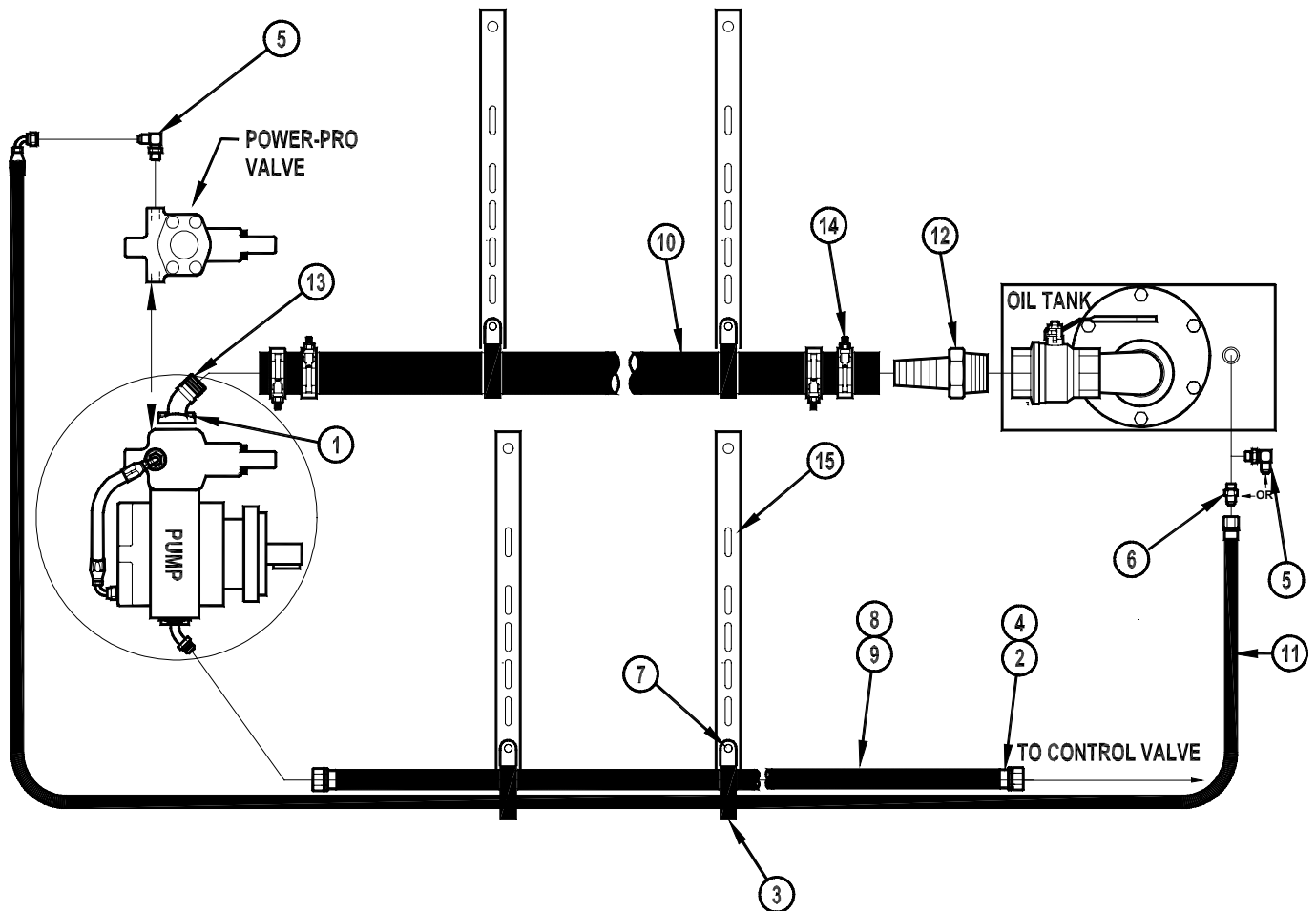


PLUMBING DIAGRAM

**FRONT MOUNT PUMP KIT with OVERSPEED
272-5855**

REF	PART NO.	DESCRIPTION	REQ'D
1	219-1893	PUMP, hydraulic with dry valve (see section 5).....	1
2	054-8722	FLANGE KIT, 45° split	1
	054-8722-001	ELBOW, 45°	1
	026-3932-020	O-RING	1
	054-8722-002	HALVES, flange	2
	FS071022	CAPSCREW – 7/16" – 14NC x 1-1/4"	4
	FS551000	WASHER, lock – 7/16"	4
3	272-5354	SHIFT KIT, electric air (see section 5).....	1
4	272-5630	HOSE KIT (see page 4.45).....	1
5	108-4545	CONTROLLER, overspeed	1
6	FS071126	CAPSCREW – 1/2" – 13NC x 1-3/4"	4
7	FS231100	NUT, lock – 1/2" – 13NC	4

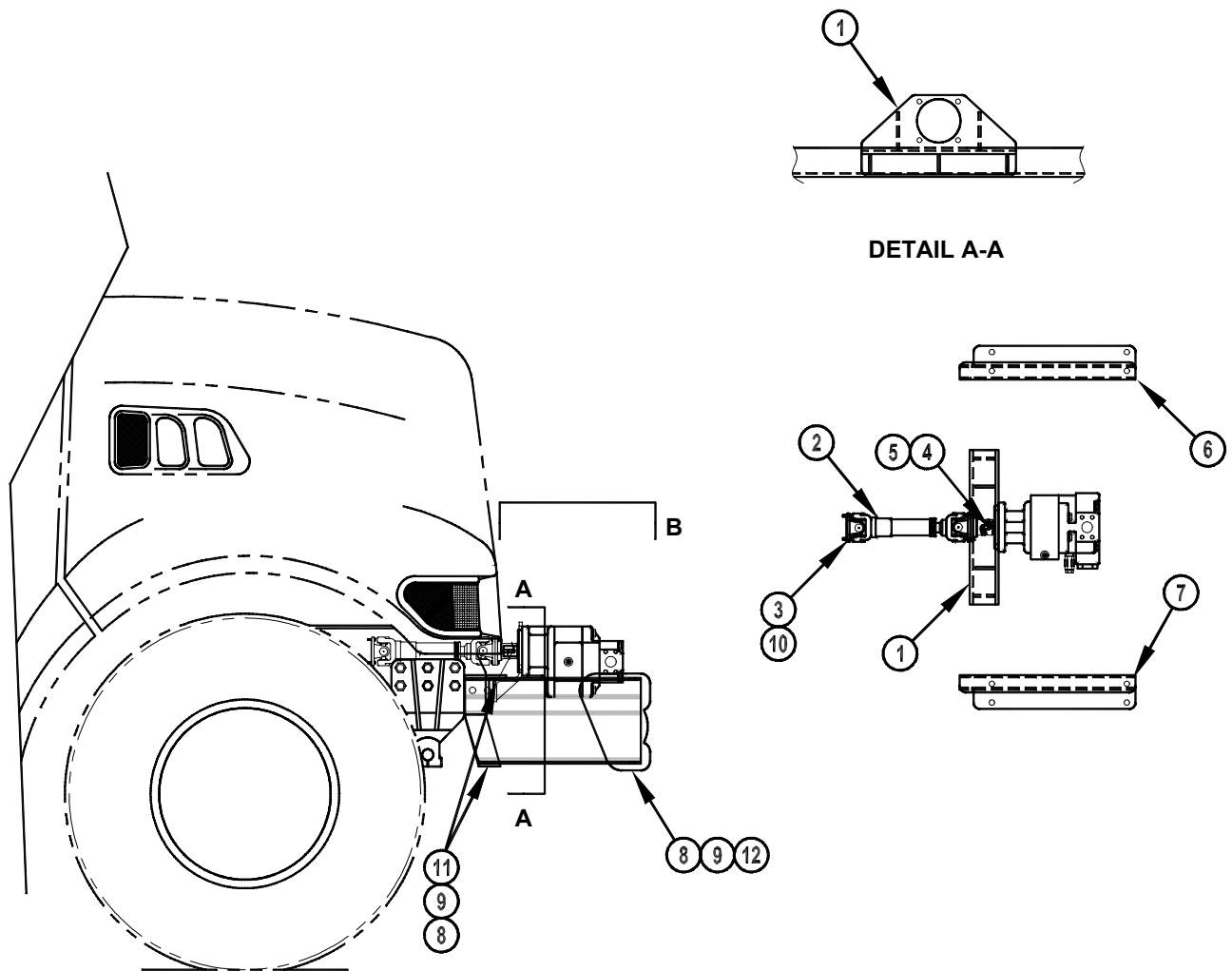
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**FRONT MOUNT PUMP HOSE KIT
272-5630**

REF	PART NO.	DESCRIPTION	REQ'D
1	054-8736-005	FLANGE KIT – 4- bolt – 1-1/2"	1
	054-8736-034	FLANGE, halves	2
	054-8736-013	O-RING	1
	FS081144	CAPSCREW – 1/2" – 13NC x 3-1/2"	4
	FS541000	WASHER, lock – 1/2"	4
2	035-2727	GUARD, hose	14ft
3	036-1295-007	CLAMP, hose – 2-7/16"	8
4	036-1499	CLAMP, bandit – fiber guard.....	2
5	054-3340-005	ELBOW, 90° - 3/8" SAE.....	2
6	054-3341-005	ADAPTER, straight – 3/8" SAE.....	1
7	FS070920	CAPSCREW – 3/8" – 16NC x 1"	8
	FS230900	NUT, lock – 3/8" – 16NC	8
8	057-1719-010	FITTING, pressure hose	2
9	057-1719	HOSE, pressure	14ft
	057-1719-004	HOSE, pressure-with reuseable end-(shipper units)	1
10	057-2172	HOSE, suction – 2" x 16ft	1
11	057-2223-001	HOSE, hydraulic – 3/8" with reuseable end.....	1
12	058-8579-006	FITTING, suction hose.....	1
13	074-4486-008	ELBOW, 45° (check pump kit for correct elbow)	1
	074-4487-008	ELBOW, 90° (check pump kit for correct elbow)	1
14	074-4498-032	CLAMP, suction hose.....	4
15	211-9851	BRACKET, hose support	4

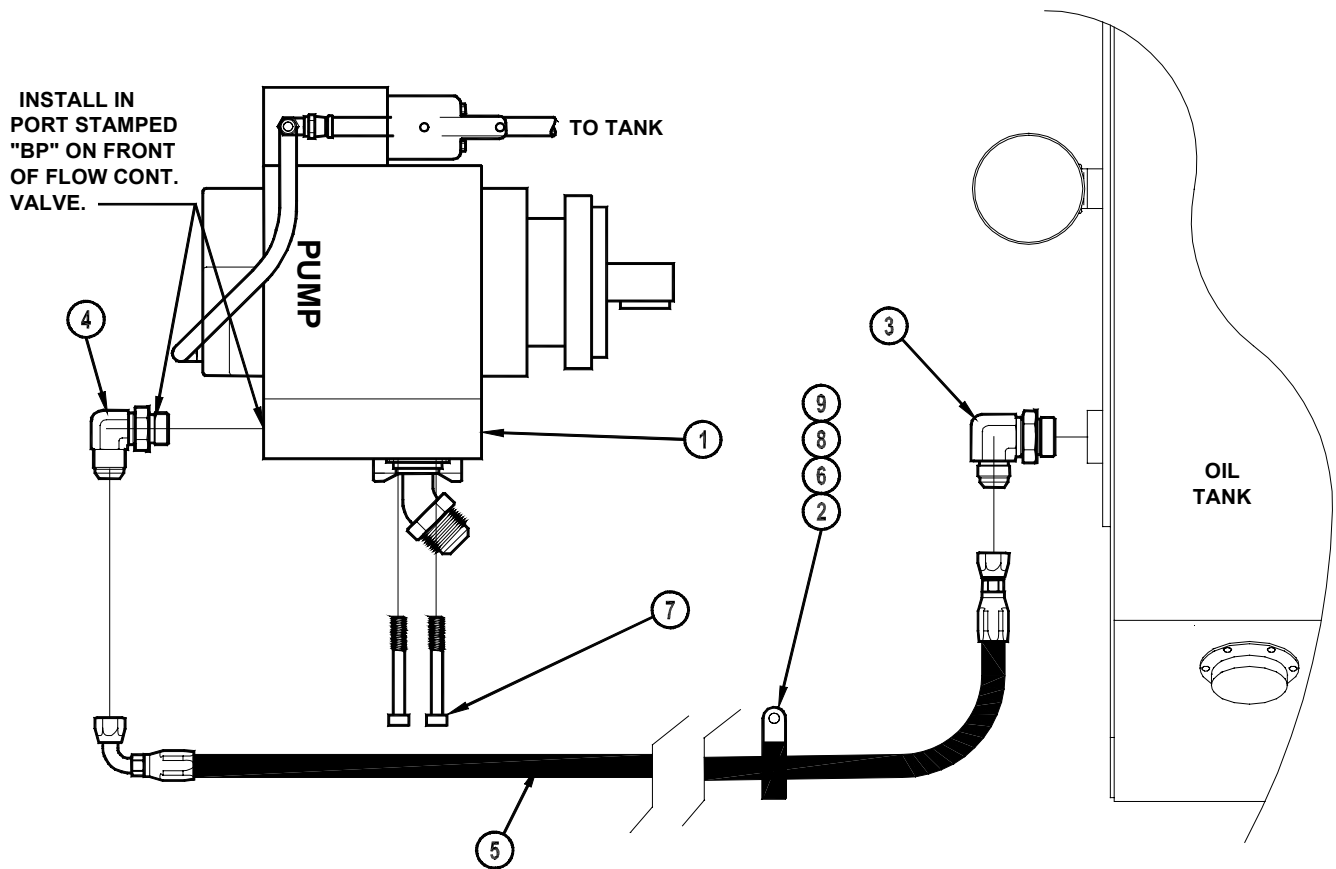
**FRONT MOUNT PUMP INSTALLATION for
STERLING ACTERRA CHASSIS
372-0355**



**FRONT MOUNT PUMP INSTALLATION for
STERLING ACTERRA CHASSIS
372-0355**

REF	PART NO.	DESCRIPTION	REQ'D
1	311-1635	BRACKET, pump	1
2	030-0705-009	DRIVELINE ASSEMBLY	1
3	047-1794	CAPSCREW – 7/16 – 20NC x 1"	4
4	047-2193	SETSCREW	2
5	263-0042	WIRE, lock	1
6	311-1634-00L	BRACKET, bumper extension – left hand	1
7	311-1634-00R	BRACKET, bumper extension – right hand	1
8	FS521100	WASHER, flat – 1/2"	6
9	FS231100	NUT, lock – 1/2" – 13NC	6
10	FS551000	WASHER, lock – 7/16"	4
11	FS071124	CAPSCREW – 1/2" – 13NC x 1-1/2"	4
12	FS021134	BOLT, carriage – 1/2" – 13NC x 2-1/2"	4

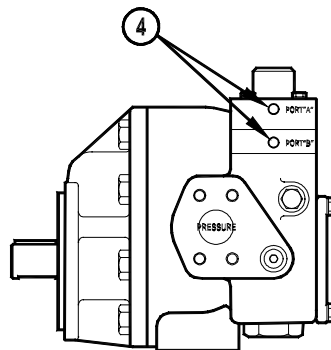
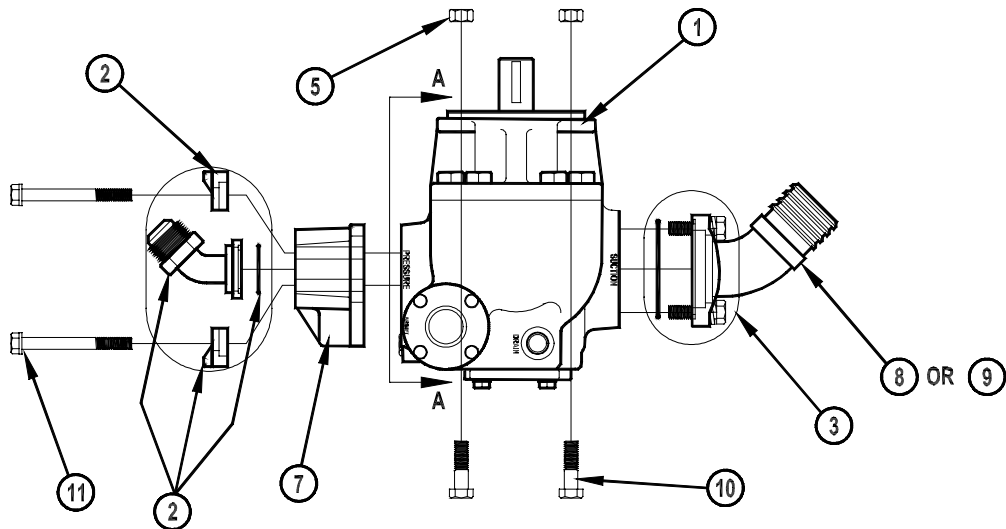
**FLOW CONTROL KIT
272-5859**



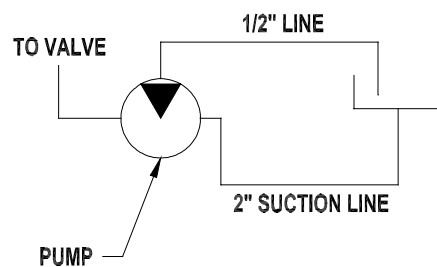
**FLOW CONTROL KIT
272-5859**

REF	PART NO.	DESCRIPTION	REQ'D
1	031-5742	VALVE, flow control (see section 5)	1
2	036-1478	CLAMP, support	4
3	054-3237-003	ELBOW, 90°	1
4	054-3340-006	ELBOW, 90°	1
5	057-2224-001	HOSE, hydraulic – with reuseable ends	1
6	FS070920	CAPSCREW – 3/8" – 16NC x 1"	4
7	FS131042	CAPSCREW, socket head – 7/16" – 14nc x 3-1/4"	4
8	FS230900	NUT, lock – 3/8" – 16NC	4
9	FS510900	WASHER, flat – 3/8"	8

FRONT MOUNT PUMP KIT with FLOW CONTROL 272-8460



VIEW A-A

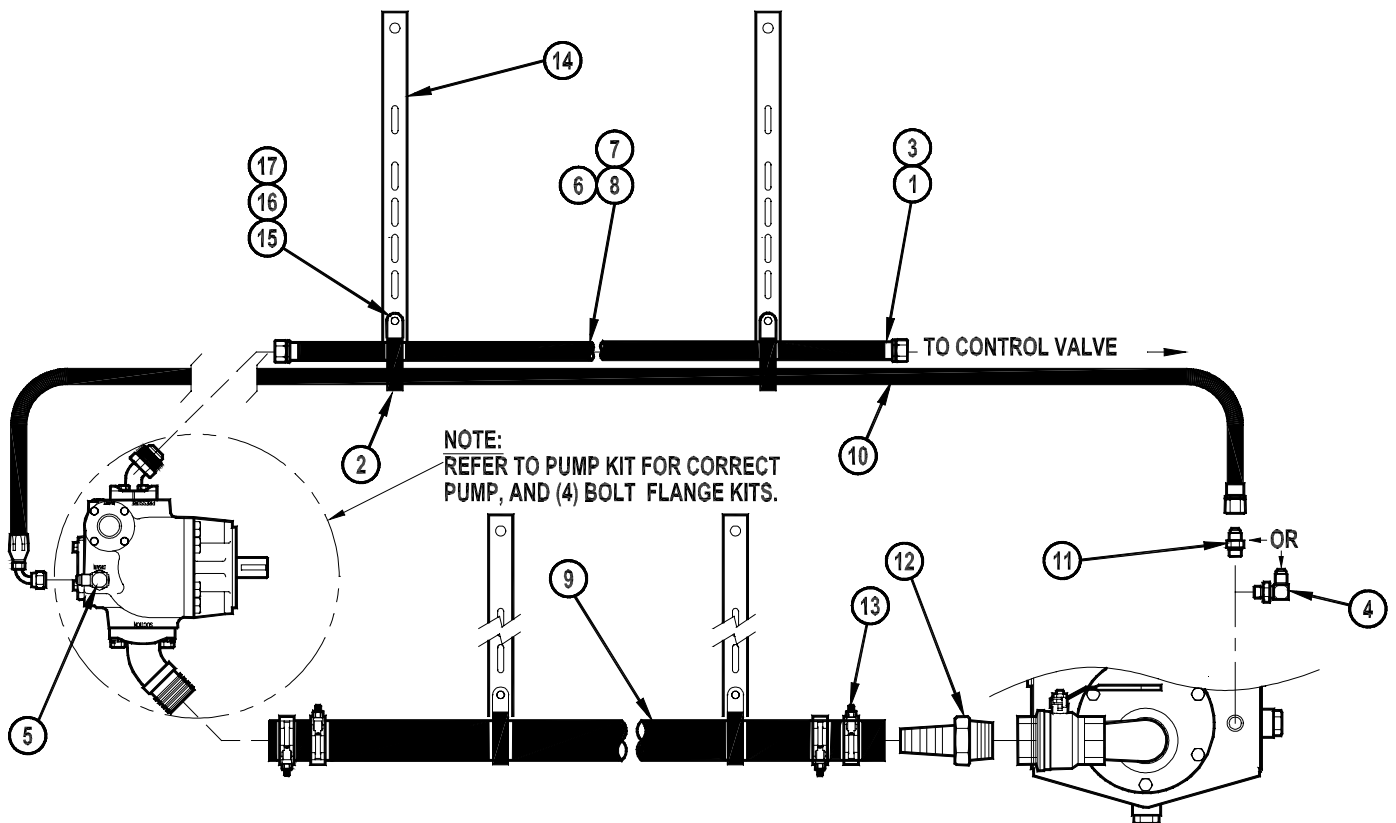


PLUMBING DIAGRAM

**FRONT MOUNT PUMP KIT with FLOW CONTROL
272-8460**

REF	PART NO.	DESCRIPTION	REQ'D
1	219-1995	PUMP, hydraulic (see section 5).....	1
2	054-8722	FLANGE KIT, 45° split – 1-1/4"	1
	054-8722-001	ELBOW, 45°	1
	026-3932-020	O-RING	1
	054-8722-002	FLANG, halves	2
3	054-8736-006	FLANGE KIT, 4-bolt – 2"	1
	054-8736-036	FLANGE, halves	2
	054-9888-003	O-RING	1
	FS081144	CAPSCREW – 1/2" – 13NC x 3-1/2"	4
	FS541000	WASHER, lock – 1/2"	4
4	272-7973	AIR SHIFT KIT (see page 4.65).....	1
5	FS231100	NUT, lock – 1/2" – 13NC	4
6	FS551000	WASHER, lock – 7/16"	4
7	031-5801-044	VALVE, flow regulator	1
8	054-8667-001	FITTING, 45° suction flange	1
9	054-8668-001	FITTING, 90° suction flange	1
10	FS071126	CAPSCREW – 1/2" – 13NC x 1-3/4"	4
11	FS081050	CAPSCREW – 7/16" – 14NC x 4"	4
12	272-8459	HOSE KIT, front mount (see page 4.53)	1

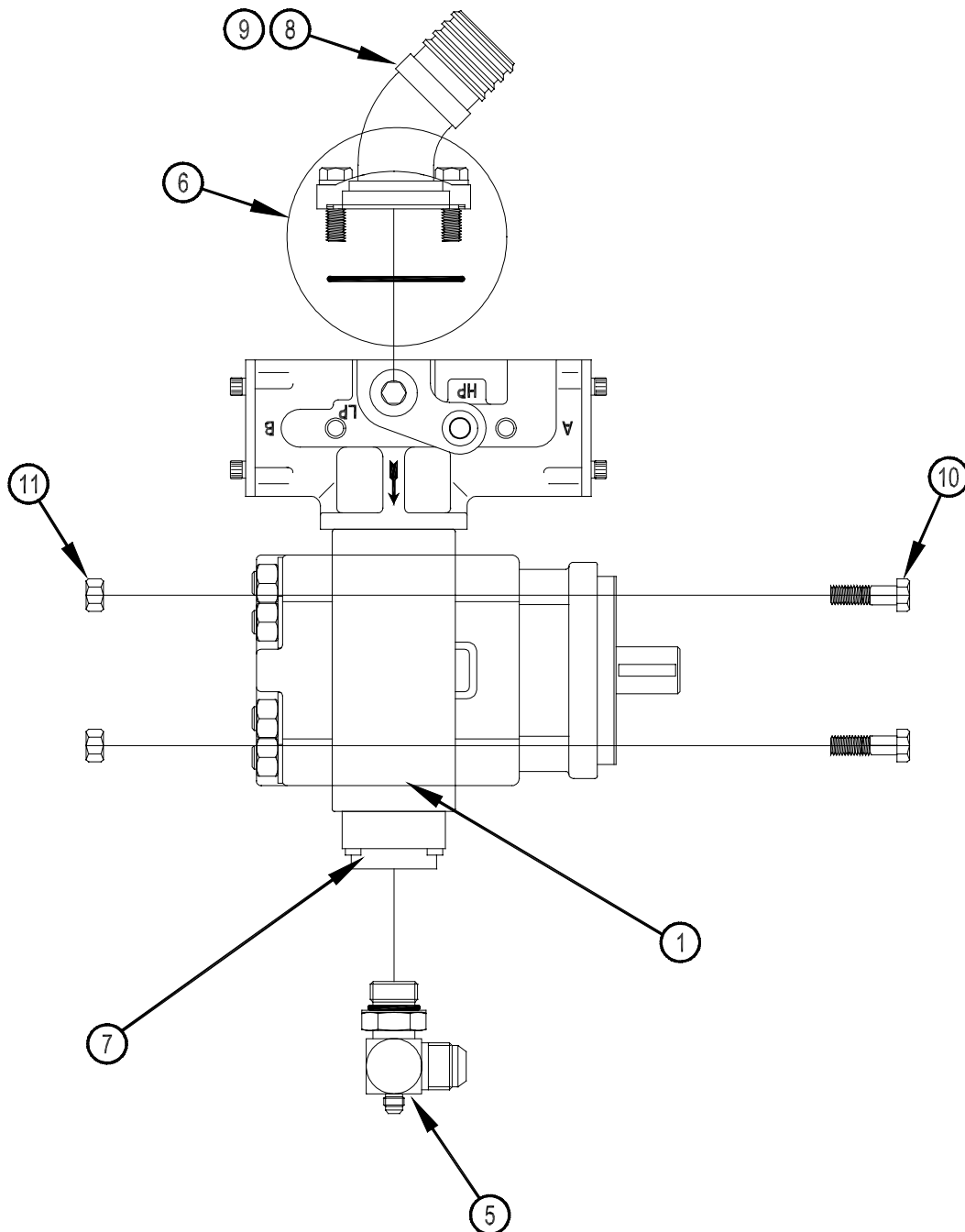
FRONT MOUNT PUMP HOSE KIT 272-8459



FORMULA 4000**FRONT MOUNT PUMP HOSE KIT
272-8459**

REF	PART NO.	DESCRIPTION	REQ'D
1	035-2727	GUARD, fiber	17ft
2	036-1295-007	CLAMP – 2-7/16"	10
3	036-1499	clamp, BANDIT	2
4	054-3237-018	ELBOW, 90° reducing.....	1
5	054-3340-006	ELBOW, 90° male.....	1
6	FS520900	WASHER, flat – 3/8"	20
7	057-1719-010	FITTING, pressure hose	2
8	057-1719	HOSE, hydraulic – pressure	17ft
9	057-2172	HOSE, suction – 2"	17ft
10	057-2248-001	HOSE, hydraulic – with reuseable end – 1/2"	1
11	058-3205-022	REDUCER – 3/8" x 1/2"	1
12	058-8579-006	FITTING, suction hose.....	1
13	074-4498-032	CLAMP, suction hose.....	4
14	211-9851	BRACKET, hose support	6
15	FS070920	CAPSCREW – 3/8" – 16NC x 1"	10
16	FS230900	NUT, lock – 3/8" – 16NC	20

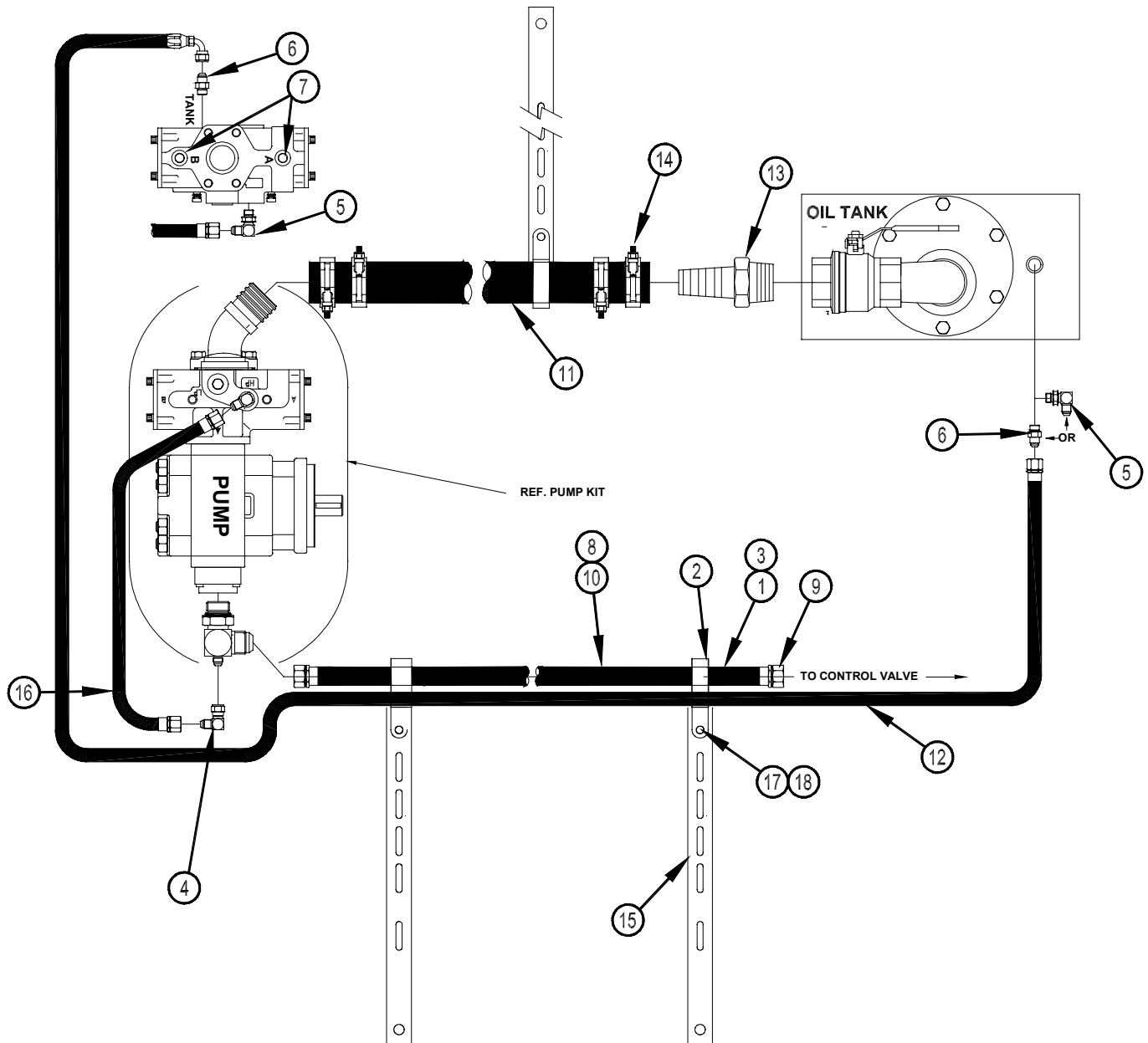
FRONT MOUNT PUMP KIT 272-7153



**FRONT MOUNT PUMP KIT
272-7153**

REF	PART NO.	DESCRIPTION	REQ'D
1	219-1870	PUMP, hydraulic with dry valve (see section 5).....	1
2	272-7973	ELECTRIC/AIR SHIFT KIT (see page 4.59)	1
3	272-8423	HOSE KIT (see page 4.57).....	1
5	054-8513	ELBOW, 90° with 3/8" spud	1
6	054-8736-006	FLANGE KIT, 4-bolt – 2"	1
	054-8736-036	FLANGE, half	2
	054-9888-003	O-RING	1
	FS081144	BOLT – 1/2" – 13NC x 3-1/2"	4
	FS541000	WASHER, lock – 1/2"	4
7	074-4458	FLANGE, o-ring.....	1
8	054-8667-001	ELBOW, 45° - 2" SAE	1
9	054-8668-001	ELBOW, 90° - 2" SAE	1
10	FS071126	CAPSCREW – 1/2" – 13NC x 1-3/4"	4
11	FS231100	NUT, lock – 1/2" – 13NC	4

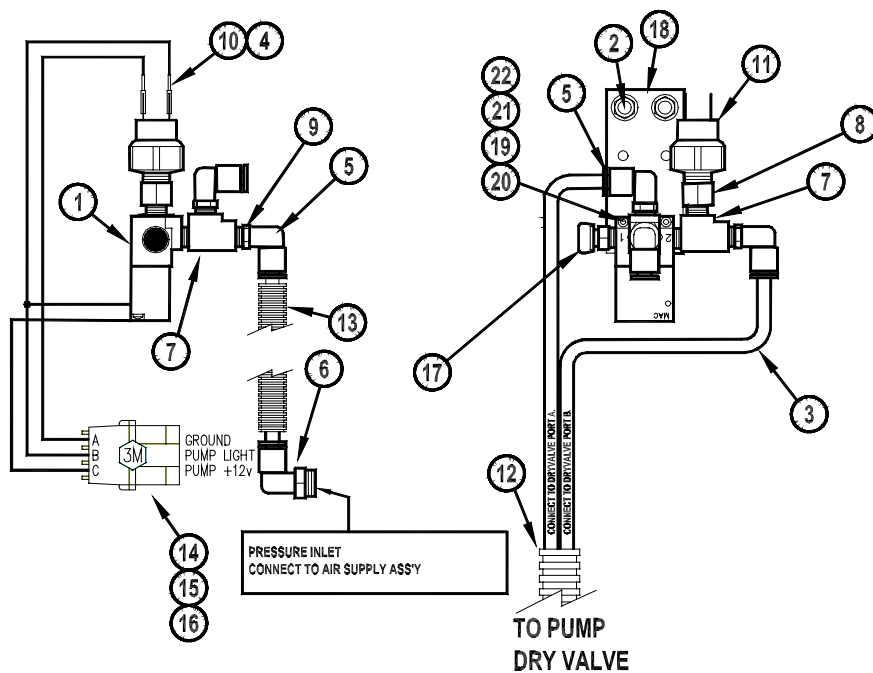
FRONT MOUNT HOSE KIT 272-8423



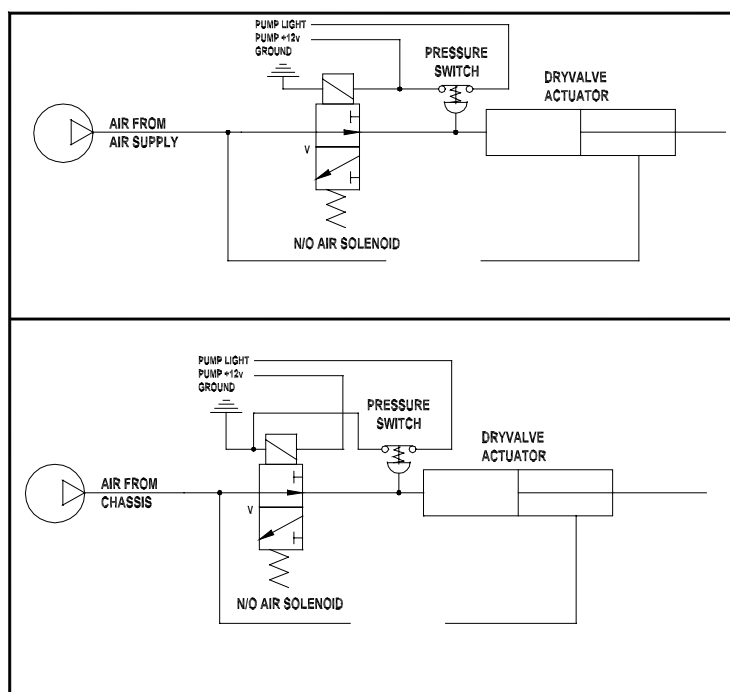
**FRONT MOUNT HOSE KIT
272-8423**

REF	PART NO.	DESCRIPTION	REQ'D
1	035-2727	GUARD, fiber	16ft
2	036-1295-007	CLAMP – 2-7/16"	12
3	036-1499	CLAMP, bandit	2
4	054-2988-005	ELBOW, 90°	1
5	054-3340-005	ELBOW, 90°	2
6	054-3341-005	CONNECTOR, straight	2
7	054-4194-002	ADAPTER	2
8	057-1719-003	END, pressure hose reuseable (shipper unit)	1
9	057-1719-010	FITTING, pressure hose	2
10	057-1719	HOSE, pressure (bulk)	16ft
11	057-2172	HOSE, suction – 2"	17ft
12	057-2223-001	HOSE, hydraulic with reuseable end	1
13	058-8579-006	FITTING, suction – 2"	1
14	074-4498-032	CLAMP, suction hose	4
15	211-9851	SUPPORT	8
16	QD2-FEFE-025	HOSE, hydraulic	1
17	FS070920	CAPSCREW – 3/8" – 16NC x 1"	14
18	FS230900	NUT, lock – 3/8" – 16NC	14

PUMP AIR SHIFT KIT 272-7973



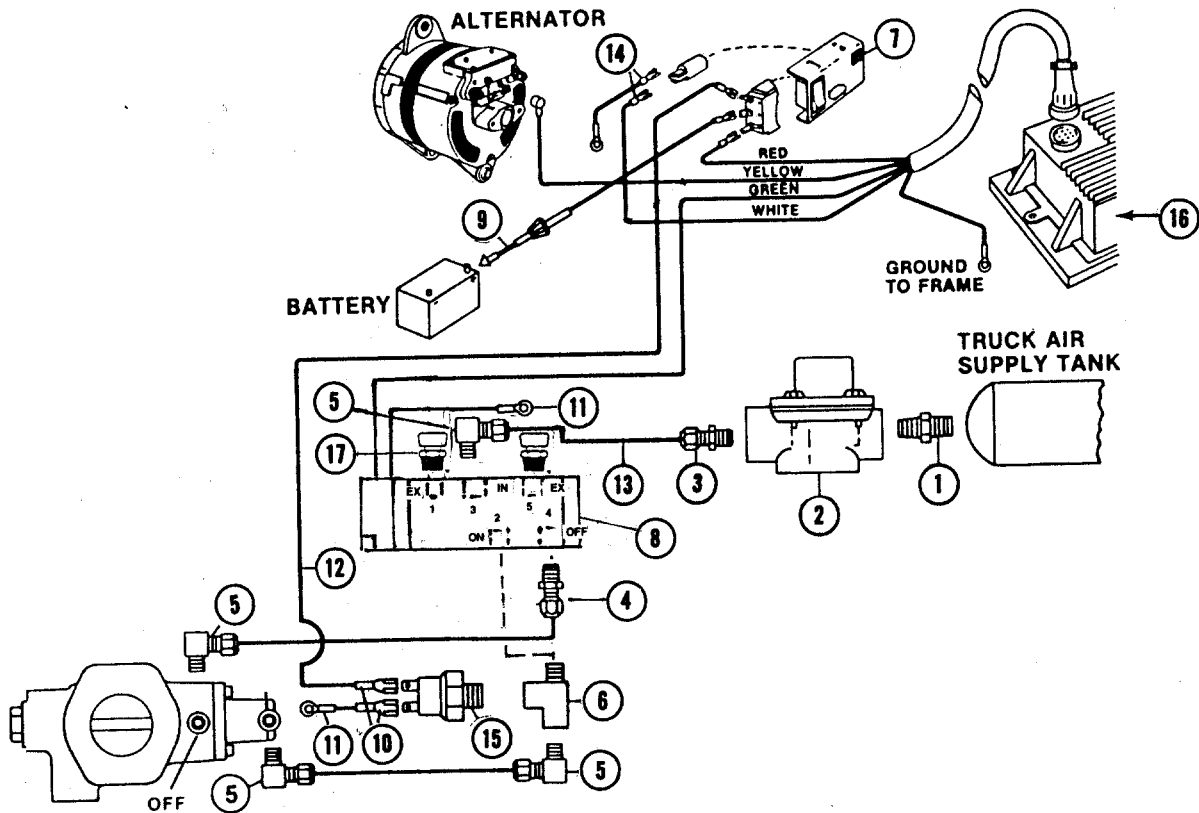
ELECTRICAL/PNEUMATIC DIGRAM



**PUMP AIR SHIFT KIT
272-7973**

REF	PART NO.	DESCRIPTION	REQ'D
1	031-5724-012	VALVE, solenoid	1
2	047-2151-001	TEK SCREW – 1/4"	2
3	054-5449	LINE, air – 1/4"	36ft
4	054-7350	TUBING, shrink	2"
5	054-8470-003	ELBOW, 90° reducing – 1/8" x 1/4"	2
6	054-8470-004	ELBOW, 90° - 1/4" x 1/4"	3
7	054-8470-001	TEE	1
8	054-8881-003	FITTING, reducer	1
9	054-8927-003	NIPPLLE, pipe – 1/4" cx 1/8"	1
10	108-0880	TERMINAL, quick disconnect	2
11	108-4176-006	SWITCH, pressure	1
12	108-4476	LOOM, electrical	12ft
13	108-4498	LOOM, electrical	12ft
14	108-4827-005	CONNECTOR, 3-way male	1
15	108-4827-011	TERMINAL, male	3
16	108-4827-013	SEAL, cable	3
17	108-5354-006	VENT, breather	1
18	211-5744	BRACKET, throttle solenoid	1
19	FS270300	NUT, hex - #8 – 32	2
20	FS420320	SCREW, machine - #8 – 32 x 1-1/2"	2
21	FS510300	WASHER, flat - #8	2
22	FS550300	WASHER, lock - #8	2

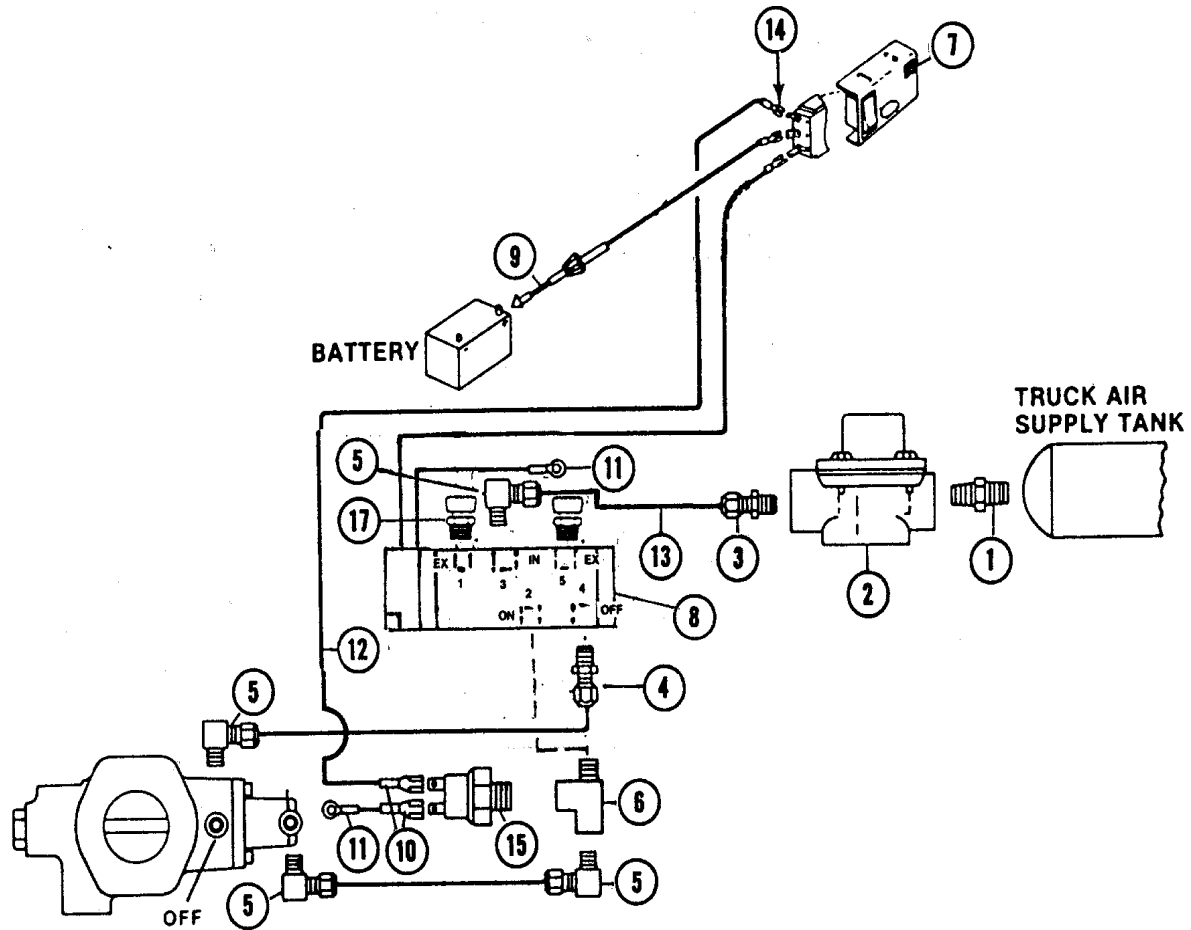
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**ELECTRIC/AIR SHIFT KIT with OVERSPEED
108-5354**

REF	PART NO.	DESCRIPTION	REQ'D
1	108-4176-011	NIPPLE.....	1
2	108-4176-010	VALVE, pressure protection.....	1
3	108-5354-001	FITTING, tube.....	1
4	108-5354-002	FITTING, tube.....	1
5	108-4176-013	ELBOW, fitting.....	4
6	108-4176-005	TEE.....	1
7	108-4176-012	SWITCH & LIGHT ASSEMBLY.....	1
8	108-5354-003	VALVE, solenoid.....	1
9	108-4176-014	HOLDER, fuse.....	1
10	108-4176-007	CLIP, terminal.....	2
11	108-4176-008	TERMINAL, ring.....	2
12	108-5354-004	WIRE.....	1
13	108-4176-010	TUBING, air.....	30ft
14	108-4176-013	CONNECTOR, female spade.....	5
15	108-5354-005	SWITCH, pressure.....	1
16	108-4545	SWITCH, electronic overspeed.....	1
17	108-5354-06	BREATHER.....	2

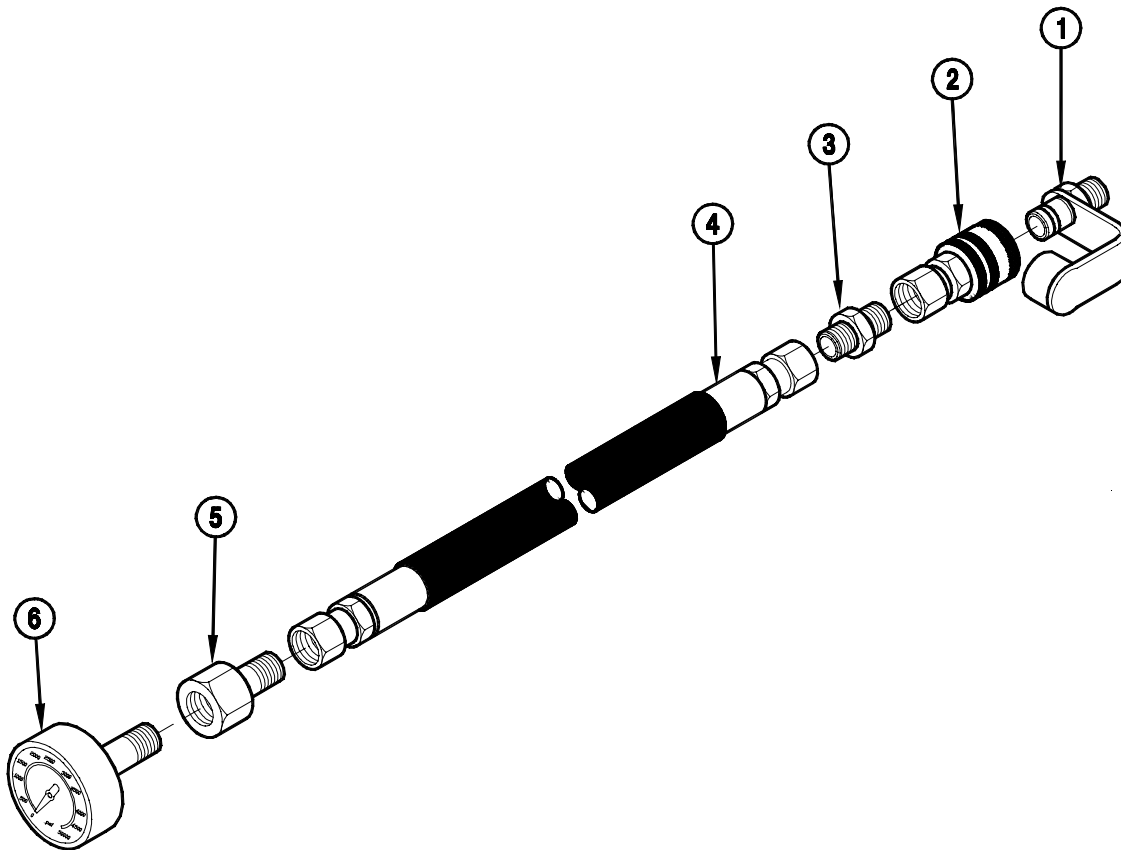
ELECTRIC/AIR SHIFT KIT without OVERSPEED
108-5355



**ELECTRIC/AIR SHIFT KIT without OVERSPEED
108-5355**

REF	PART NO.	DESCRIPTION	REQ'D
1	108-4176-011	NIPPLE	1
2	108-4176-010	VALVE, pressure protection	1
3	108-5354-001	FITTING, tube	1
4	108-5354-002	FITTING, tube	1
5	108-4176-013	ELBOW, fitting	4
6	108-4176-005	TEE	1
7	108-4176-012	SWITCH & LIGHT ASSEMBLY	1
8	108-5354-003	VALVE, solenoid	1
9	108-4176-014	HOLDER, fuse	1
10	108-4176-007	CLIP, terminal	2
11	108-4176-008	TERMINAL, ring	2
12	108-5354-004	WIRE	1
13	108-4176-010	TUBING, air	30ft
14	108-4176-013	CONNECTOR, female spade	5
15	108-5354-005	SWITCH, pressure	1
16	108-5354-006	BREATHER	2

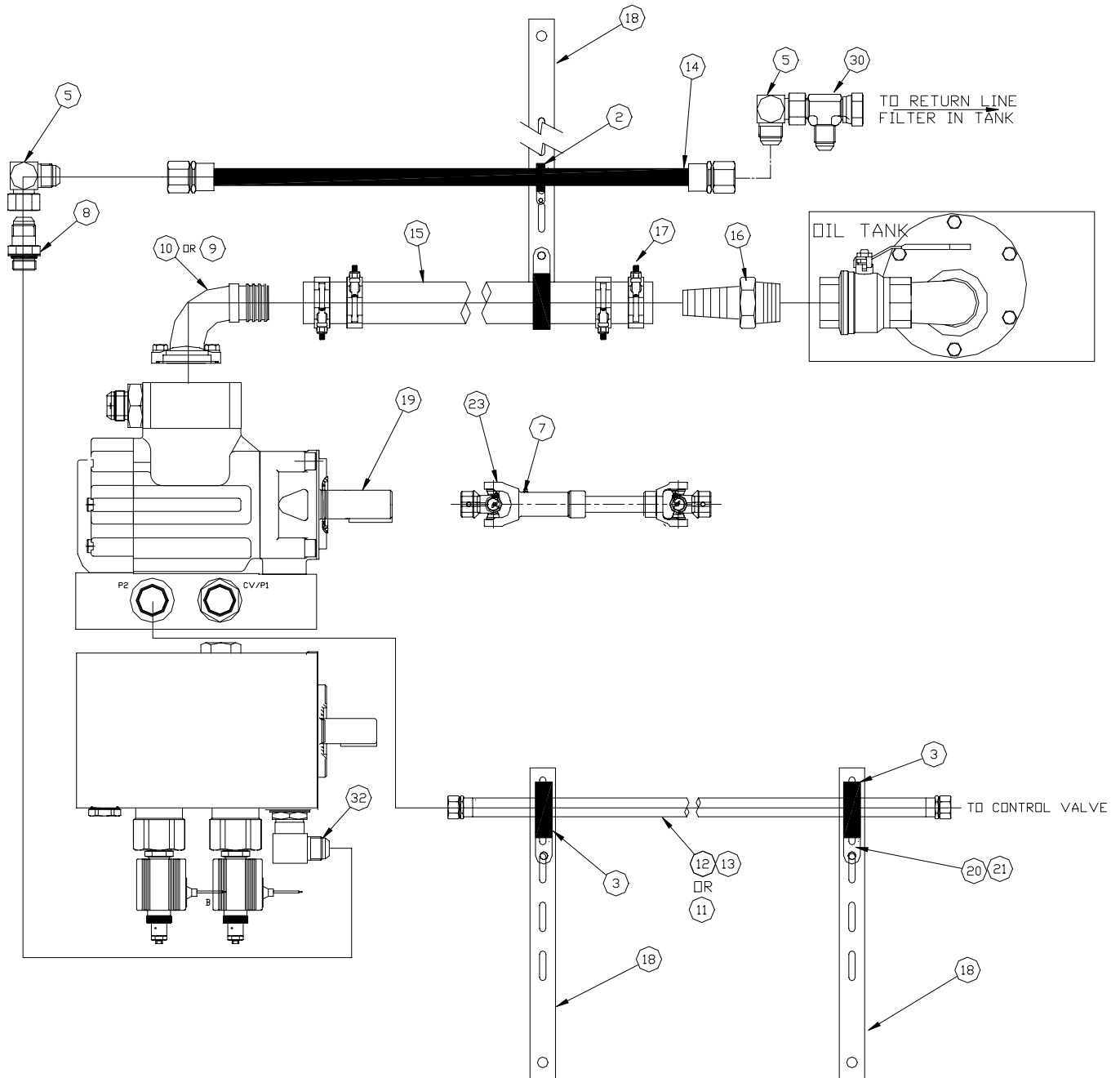
**PRESSURE TEST GAUGE KIT
272-6347**



**PRESSURE TEST GAUGE KIT
272-6347**

REF	PART NO.	DESCRIPTION	REQ'D
1	031-5601-003	DISCONNECT, quick – male.....	1
2	031-5601-002	DISCONNECT, quick – female.....	1
3	054-3526-004	CONNECTOR.....	1
4	QZ1-FCFC-017	HOSE, hydraulic.....	1
5	054-3532-014	CONNECTOR.....	1
6	067-0640	GAUGE, pressure – 0-5000 PSI.....	1

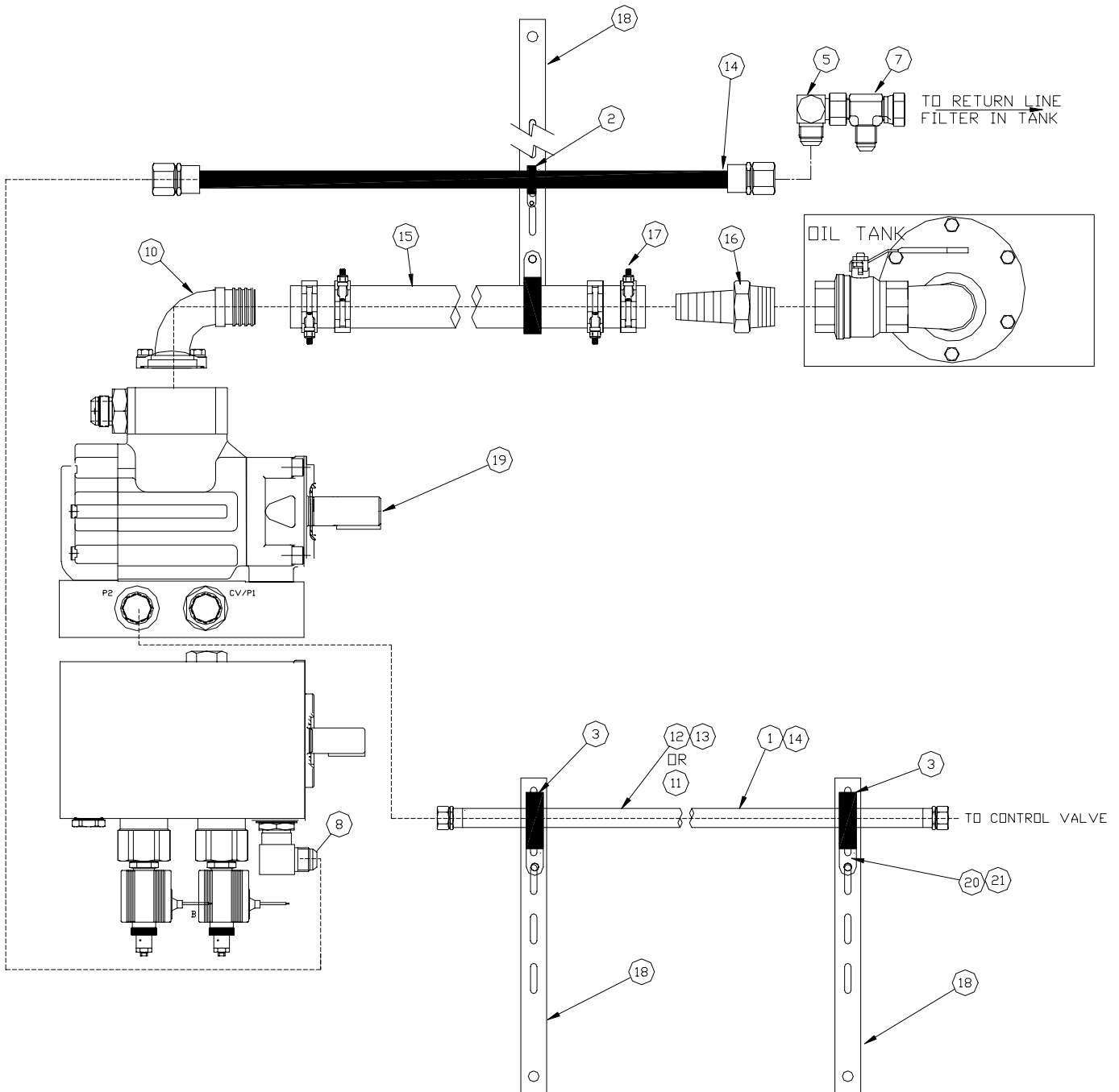
PTO MOUNT TANDEM VANE PUMP INSTALLATION 372-2280



FORMULA 4000**PTO MOUNT TANDEM VANE PUMP INSTALLATION
372-2280**

REF	PART NO.	DESCRIPTION	REQ'D
1	035-2727	GUARD, fiber	20 ft.
2	036-1122-018	CLAMP, hose – 1-1/8"	6
3	036-1122-033	CLAMP, hose – 2-7/16"	6
4	036-1499	CLAMP, bandit.....	2
5	054-2988-010	ELBOW, 90° - 1"	2
6	054-3005-010	ELBOW, 45° - 1"	1
7	030-0850-026	DRIVE LINE ASSEMBLY	1
8	054-3341-010	CONNECTOR, straight	1
9	054-8667	FLANGE KIT, 45° suction.....	1
	054-8667-001	ELBOW, 45°	1
	054-8668-002	HALVES, flange.....	2
	054-8668-003	HALF, clamp	1
	054-8668-004	HALF, clamp	1
	054-8668-005	O-RING	1
	054-8668-006	CAPSCREW – 1/2" – 13NC x 1-1/4"	4
	054-8668-009	NUT, lock – 1/2" – 13NC	4
10	054-8668	FLANGE KIT, 90° suction.....	1
	054-8668-001	ELBOW, 90°	1
	054-8668-002	HALVES, flange.....	2
	054-8668-003	HALF, clamp	1
	054-8668-004	HALF, clamp	1
	054-8668-005	O-RING	1
	054-8668-006	CAPSCREW – 1/2" – 13NC x 1-1/4"	4
	054-8668-009	NUT, lock – 1/2" – 13NC	4
11	057-1719-002	END, reuseable hose – 1" (for shipper units only)	1
12	057-1719-010	FITTING, pressure hose – 1"	2
13	057-1719	HOSE, hydraulic –1" (bulk).....	20 ft.
14	057-2194-120	HOSE, hydraulic – w/reuseable end	1
15	057-2232	HOSE, suction – 2"	17 ft.
16	058-8579-006	FITTING, suction hose	1
17	074-4498-032	CLAMP, suction hose – 2-1/2"	4
18	211-9851	SUPPORT, hose	8
19	219-2273	PUMP, hydraulic.....	1
21	FS070920	CAPSCREW – 3/8" – 16NC x 1"	14
22	FS230900	NUT, lock – 3/8" – 16NC	14
23	263-0042	WIRE, lock	2
24	055-1391-007	WASHER, hardened – 5/8"	8
25	FS071330	CAPSCREW – 5/8" – 11NC x 2"	4

FRONT MOUNT TANDEM VANE PUMP INSTALLATION 372-2281



FORMULA 4000**FRONT MOUNT TANDEM VANE PUMP INSTALLATION
372-2281**

REF	PART NO.	DESCRIPTION	REQ'D
1	035-2727	GUARD, fiber	20 ft.
2	036-1122-018	CLAMP, hose – 1-1/8"	6
3	036-1122-033	CLAMP, hose – 2-7/16"	6
4	036-1499	CLAMP, bandit.....	2
5	054-2988-010	ELBOW, 90° - 1"	2
6	054-3005-010	ELBOW, 45° - 1"	1
7	054-3624-010	TEE – 1"	1
8	054-3341-010	CONNECTOR, straight	1
9	054-8667	FLANGE KIT, 45° suction.....	1
	054-8667-001	ELBOW, 45°	1
	054-8668-002	HALVES, flange.....	2
	054-8668-003	HALF, clamp	1
	054-8668-004	HALF, clamp	1
	054-8668-005	O-RING	1
	054-8668-006	CAPSCREW – 1/2" – 13NC x 1-1/4"	4
	054-8668-009	NUT, lock – 1/2" – 13NC	4
10	054-8668	FLANGE KIT, 90° suction.....	1
	054-8668-001	ELBOW, 90°	1
	054-8668-002	HALVES, flange.....	2
	054-8668-003	HALF, clamp	1
	054-8668-004	HALF, clamp	1
	054-8668-005	O-RING	1
	054-8668-006	CAPSCREW – 1/2" – 13NC x 1-1/4"	4
	054-8668-009	NUT, lock – 1/2" – 13NC	4
11	057-1719-002	END, reuseable hose – 1" (for shipper units only)	1
12	057-1719-010	FITTING, pressure hose – 1"	2
13	057-1719	HOSE, hydraulic –1" (bulk).....	20 ft.
14	057-2194-120	HOSE, hydraulic – w/reuseable end	1
15	057-2232	HOSE, suction - 2"	17 ft.
16	058-8579-006	FITTING, suction hose	1
17	074-4498-032	CLAMP, suction hose – 2-1/2"	4
18	211-9851	SUPPORT, hose	8
19	219-2272	PUMP, hydraulic.....	1
21	FS070920	CAPSCREW – 3/8" – 16NC x 1"	14
22	FS230900	NUT, lock – 3/8" – 16NC	14
23	372-3003	SWITCH KIT, pressure.....	1

SECTION 5 – HYDRAULIC COMPONENTS

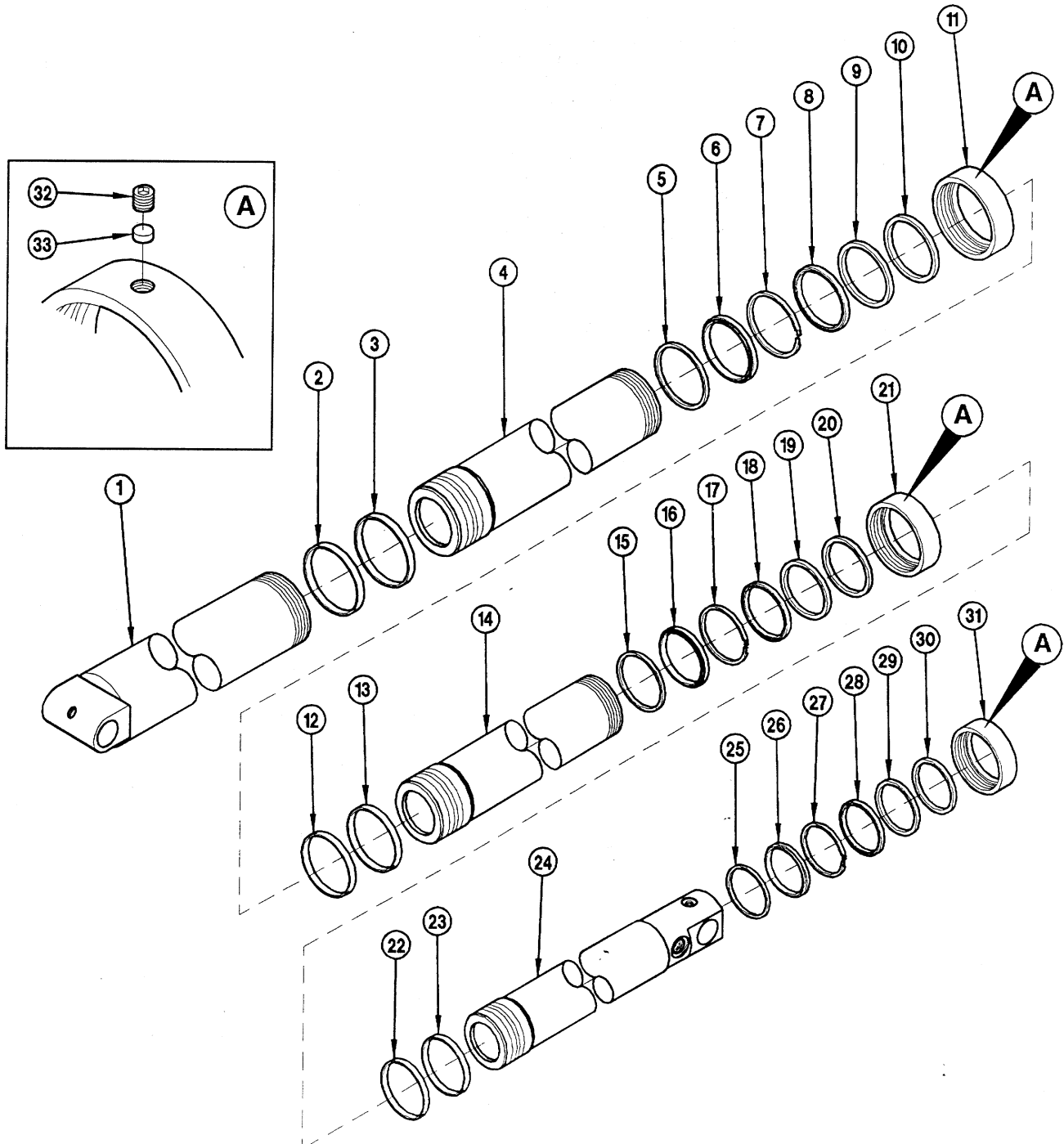
Cylinders:

Ejector (1-6222/1-6223)	5.2
Ejector (1-6224/1-6225/1-6226)	5.4
Blade (1-4108).....	5.8
Slide (1-4110).....	5.10
Tailgate Raise (1-4070)	5.12
Container Arm (1-4283).....	5.14
Grab Bar Cylinder (1-5069).....	5.16
Grab Bar Mechanism (1-4105).....	5.18
Reeving (1-6061).....	5.20

Valves/Motors/Pumps:

Underbody Valve (31-3374)	5.22
Inlet and Outlet Sections (31-3285-01 & 31-3285-03).....	5.24
Ejector Working Section (31-3285-02)	5.26
Tailgate Working Section (31-3374-01)	5.28
Tailgate Valve (31-6268-02/03/04)	5.30
Inlet and Outlet Section (31-3245-05 & 31-3245-09)	5.32
Tailgate Slide Working Section (31-3544-05)	5.34
Tailgate Blade Working Section (31-3544-06)	5.36
Optional Working Section (31-6267).....	5.38
Regenerative Valve (31-6285)	5.40
Direct Mount Pump (219-1915).....	5.42
Direct Mount Pump (219-1916).....	5.44
8,000 Lb. Winch Assembly (253-2291)	5.46
12,000 Lb. Winch Assembly (253-1472)	5.48
8,000 Lb. Winch Motor (219-1878)	5.50
12,000 Lb. Winch Motor (219-1879)	5.52
Hydraulic Oil Filter (75-0585)	5.54
Front Mount Hydraulic Pump (219-1893)	5.56
PTO Mount Hydraulic Pump (219-1738/219-1748)	5.58
Hydraulic Pump (219-1870-01)	5.60
Dry Valve (31-3230).....	5.62
Optional Hydraulic Oil Filter (75-0724).....	5.64
Powr-Pro Valve for 219-1893 Pump	5.66
Tandem Vane Hydraulic Pump Assembly (219-2272/219-2273).....	5.68
Tandem Vane Hydraulic Pump Only (219-2272-001/2273-001).....	5.70

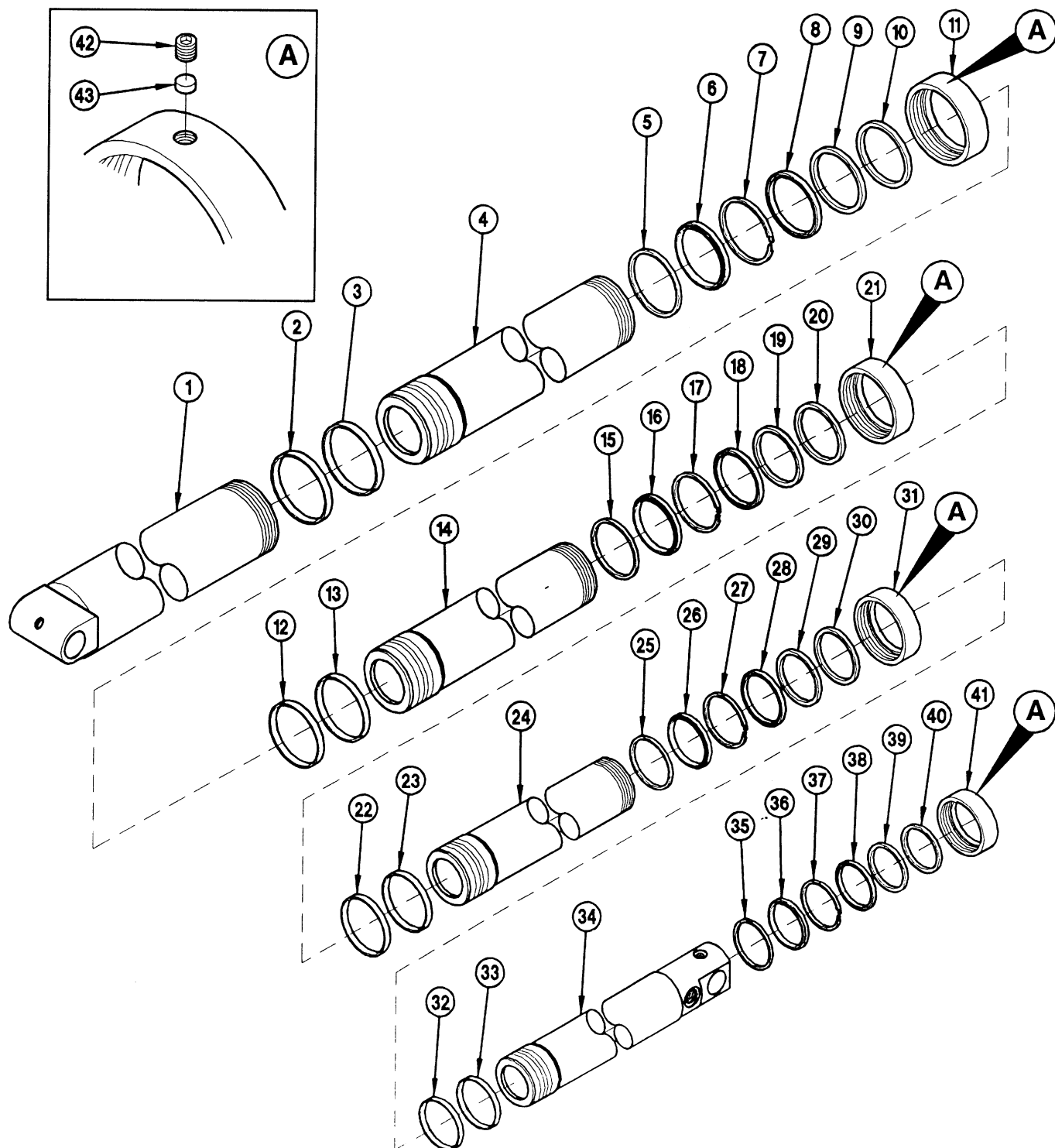
EJECTOR CYLINDER
001-6222 – STD. 13 YD & NARROW 11YD UNITS
001-6223 – STD. 16 YD & NARROW 14 YD UNITS



EJECTOR CYLINDER
001-6222 – STD. 13 YD & NARROW 11YD UNITS
001-6223 – STD. 16 YD & NARROW 14 YD UNITS

REF	PART NO.	DESCRIPTION	REQ'D
1	001-6223-001	BARREL ASSEMBLY	1
2	001-4881-019	RING, wear.....	1
3	001-4881-002	RING, piston.....	1
4	001-6223-002	SLEEVE ASSEMBLY – 5"	1
5	001-4881-022	RING, retaining - int.....	1
6	001-4906-010	RING, bottom guide	1
7	026-2083-004	RING, spiral retaining.....	1
8	001-4906-008	RING, top guide.....	1
9	001-4881-026	RING, wiper	1
10	001-4261-002	SEAL, lip (u-cup)	1
11	001-6223-005	GLAND, retaining	1
12	001-4881-018	RING, wear.....	1
13	001-4881-013	RING, piston.....	1
14	001-6223-003	SLEEVE ASSEMBLY – 4"	1
15	001-6077-006	RING, retaining - int.....	1
16	001-4906-009	RING, bottom guide	1
17	026-2083-003	RING, spiral retaining.....	1
18	001-4906-007	RING, top guide.....	1
19	001-4881-025	RING, wiper	1
20	001-4261-003	SEAL, lip (u-cup)	1
21	001-6223-006	GLAND, retaining	1
22	001-4881-017	RING, wear.....	1
23	001-4881-012	RING, piston.....	1
24	001-6222-001	PLUNGER ASSEMBLY – 3" – for 1-6222 cyl.....	1
	001-6223-004	PLUNGER ASSEMBLY – 3" – for 1-6223 cyl.....	1
25	001-4881-022	RING, retaining - int.....	1
26	001-4911-002	RING, bottom guide	1
27	026-2083-002	RING, spiral retaining.....	1
28	001-4911-003	RING, top guide.....	1
29	001-4881-024	RING, wiper	1
30	001-6065-010	SEAL, lip (u-cup)	1
31	001-6223-007	GLAND, retaining	1
32	001-3689-021	SETSCREW – 5/16" x 5/16"	3
33	001-3689-026	SLUG, nylon	3
-	272-4885	KIT, repair (consists of items 2, 3, 6 thru 10, 12, 13 16 thru 20, 22, 23, 26 thru 30)	1

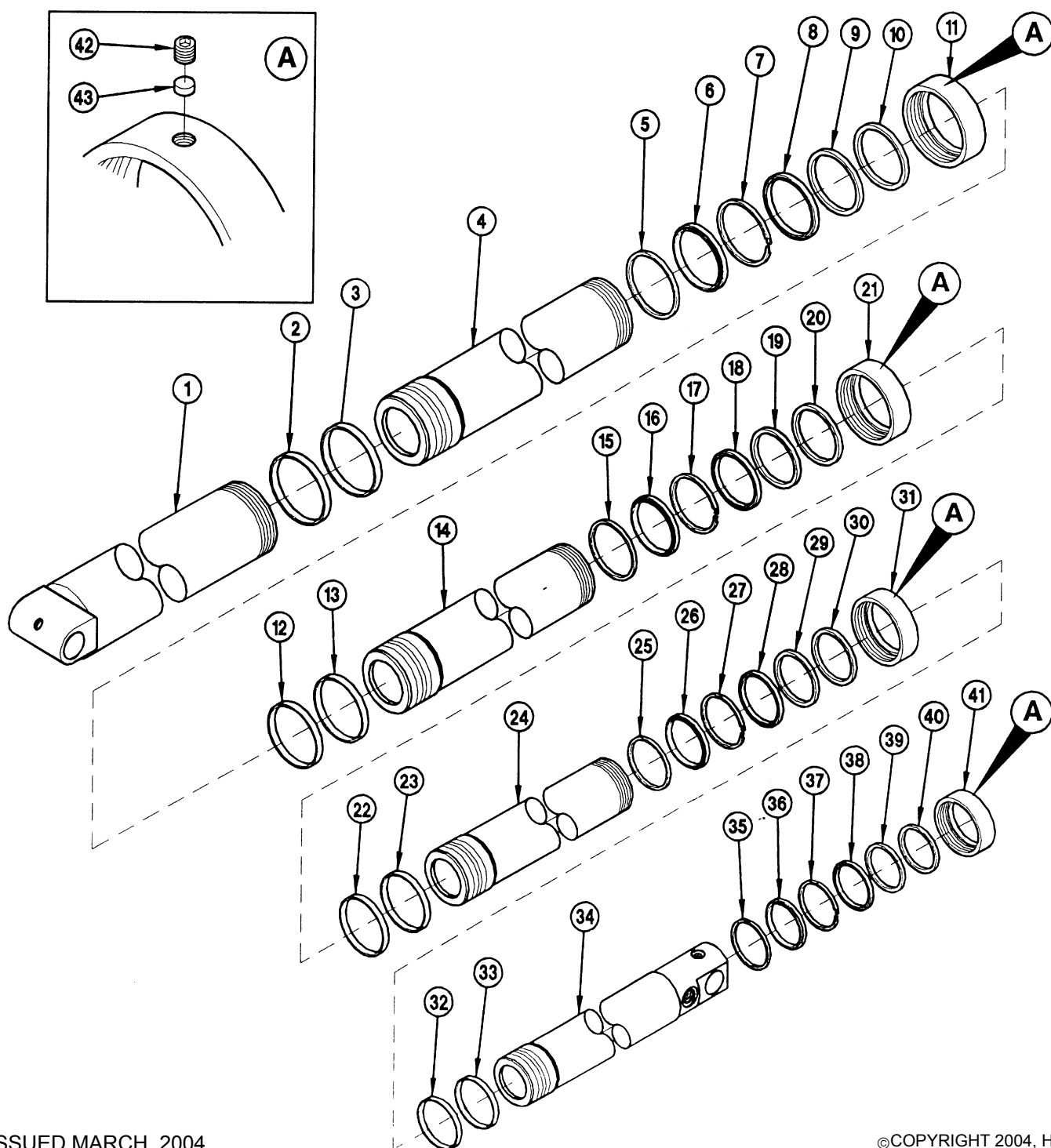
EJECTOR CYLINDER
001-6224 – STD. 18 YD AND NARROW 16 YD UNITS
001-6225 – STD. 20 YD AND NARROW 18 YD UNITS
001-6226 – STD. 25 YD UNITS



EJECTOR CYLINDER
001-6224 – STD. 18 YD AND NARROW 16 YD UNITS
001-6225 – STD. 20 YD AND NARROW 18 YD UNITS
001-6226 – STD. 25 YD UNITS

REF	PART NO.	DESCRIPTION	REQ'D
1	001-6224-001	BARREL, outer for 1-6224 & 1-6225 cyl.....	1
	001-6226-001	BARREL – for 1-6226 cyl.....	1
2	001-3743-006	RING, wear.....	1
3	001-3743-007	RING, piston.....	1
4	001-6224-005	SLEEVE – 6" dia. – for 1-6224 & 1-6225 cyl.	1
	001-6226-002	SLEEVE – 6" dia. – for 1-6226 cyl.....	1
5	001-3743-008	RING, retaining.....	1
6	001-6224-010	RING, bottom guide.....	1
7	001-6224-007	RING, spiral retaining.....	1
8	001-3743-010	RING, top guide.....	1
9	001-5021-005	WIPER.....	1
10	001-6224-008	SEAL, lip (u-cup).....	1
11	001-6224-006	GLAND, retaining.....	1
12	001-4881-019	RING, wear.....	1
13	001-4881-002	RING, piston.....	1
14	001-6223-002	SLEEVE - 5" dia – for 1-6224 & 1-6225 cyl.....	1
	001-6226-003	SLEEVE - 5" dia – for 1-6226 cyl.....	1
15	001-4881-022	RING, retaining.....	1
16	001-4906-010	RING, bottom guide.....	1
17	026-2083-004	RING, spiral retaining.....	1
18	001-4906-008	RING, top guide.....	1
19	001-4881-026	WIPER.....	1
20	001-4261-002	SEAL, lip (u-cup).....	1
21	001-6223-005	GLAND, retaining.....	1
22	001-4881-018	RING, wear.....	1
23	001-4881-013	RING, piston.....	1
24	001-6223-003	SLEEVE – 4" dia – for 1-6224 & 1-6225 cyl.....	1
	001-6226-004	SLEEVE – 4" dia. – for 1-6226 cyl.....	1
25	001-6077-006	RING, retaining.....	1
26	001-4906-009	RING, bottom guide.....	1
27	026-2083-003	RING, spiral retaining.....	1
28	001-4906-007	RING, top guide.....	1
29	001-4881-025	WIPER.....	1
30	001-4261-003	SEAL, lip (u-cup).....	1
31	001-6223-006	GLAND, retaining.....	1
32	001-4881-017	RING, wear.....	1

EJECTOR CYLINDER
001-6224 – STD. 18 YD AND NARROW 16 YD UNITS
001-6225 – STD. 20 YD AND NARROW 18 YD UNITS
001-6226 – STD. 25 YD UNITS

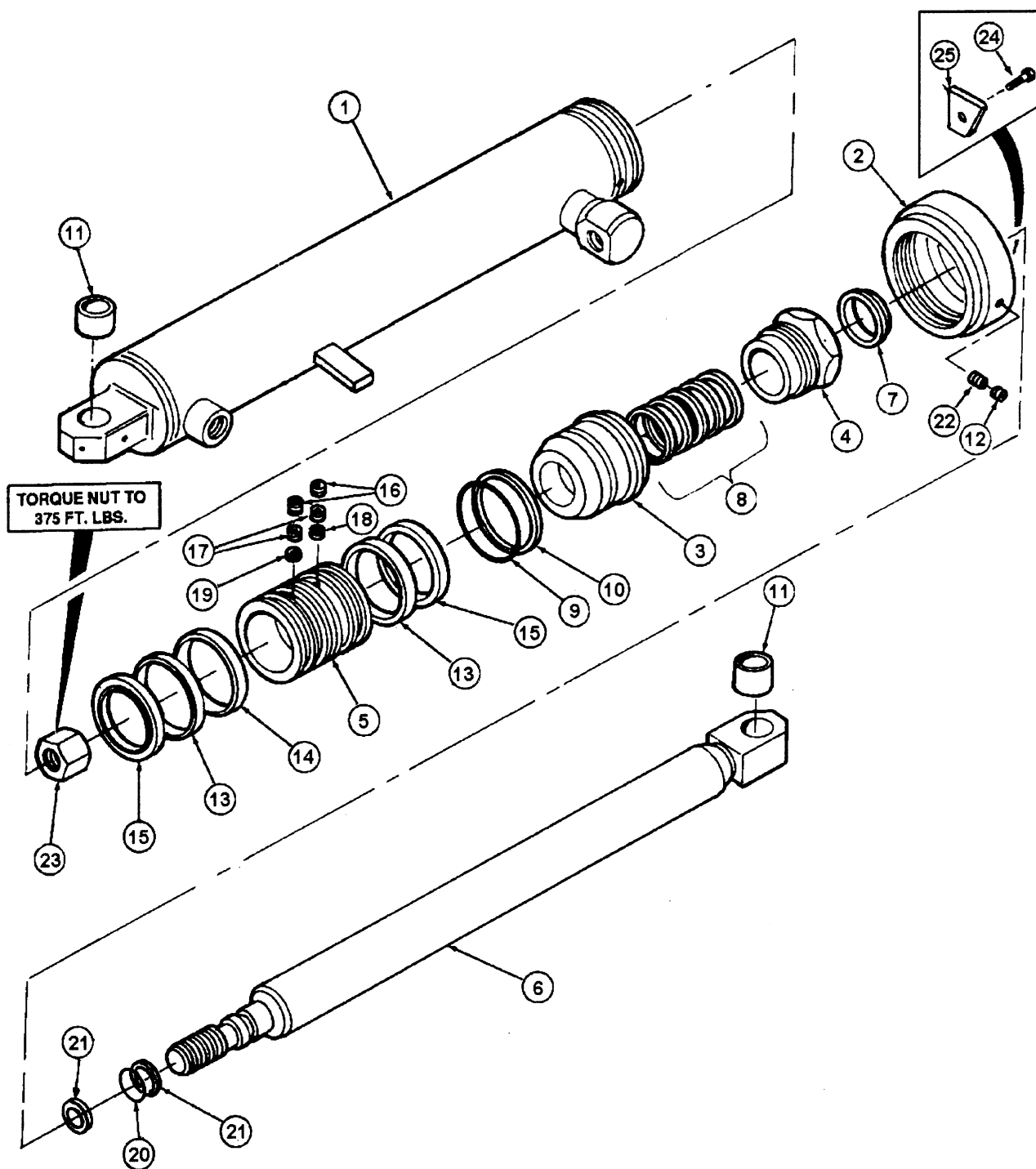


FORMULA 4000**EJECTOR CYLINDER****001-6224 – STD. 18 YD AND NARROW 16 YD UNITS****001-6225 – STD. 20 YD AND NARROW 18 YD UNITS****001-6226 – STD. 25 YD UNITS**

REF	PART NO.	DESCRIPTION	REQ'D
33	001-4881-012	RING, piston	1
34	001-6224-002	PLUNGER – 3" –for 1-6224 cyl	1
	001-6225-001	PLUNGER – 3" – for 1-6225 cyl	1
	001-6226-005	PLUNGER – 3" – for 1-6226 cyl	1 1
35	001-4881-022	RING, retaining.....	1
36	001-4911-002	RING, bottom guide	1
37	026-2083-002	RING, spiral retaining.....	1
38	001-4911-003	RING, top guide.....	1
39	001-4881-024	WIPER.....	1
40	001-6065-010	SEAL, lip (u-cup)	1
41	001-6223-007	GLAND, retaining	1
42	001-3689-021	SETSCREW	4
43	001-3689-026	SLUG, nylon	4

-	272-4884	KIT, rebuild (consists of items 2, 3, 6 thru 10, 12, 13, 16 thru 20, 22, 26 thru 30, 32, 33, 36 thru 40, 43).....	1
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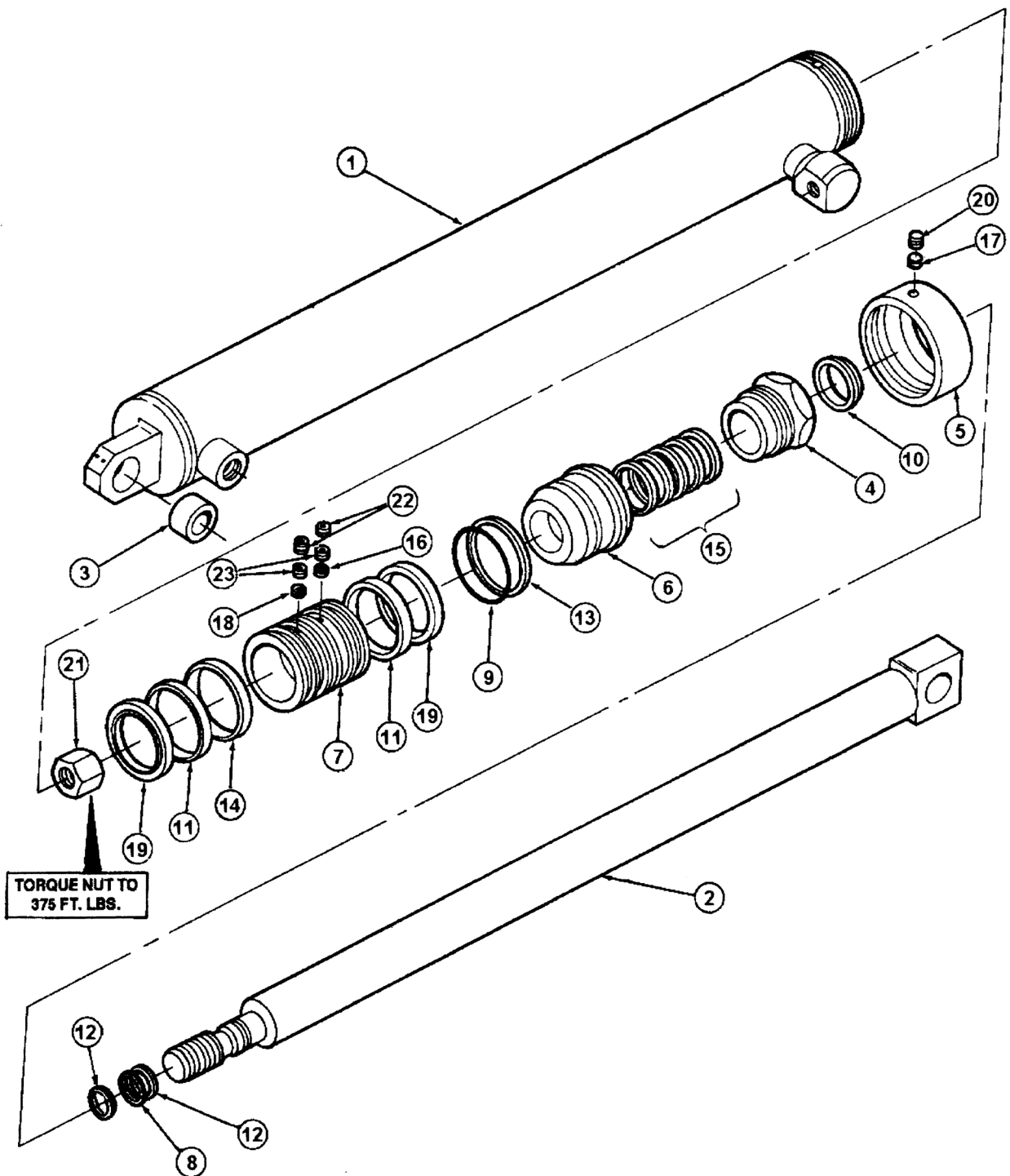
BLADE CYLINDER 001-4108



FORMULA 4000**BLADE CYLINDER
001-4108**

REF	PART NO.	DESCRIPTION	REQ'D
1	085-0166	BARREL ASSEMBLY	1
2	001-4108-001	GLAND, retaining	1
3	023-0661	GLAND, packing	1
4	023-0662	NUT, packing	1
5	024-0705	PISTON	1
6	027-3924	ROD ASSEMBLY	1
7	026-3707-010	WIPER	1
8	026-4194	V PACKING SET	1
9	026-2608-031	O-RING	1
10	026-4200-031	RING, back-up	1
11	003-3585	BUSHING	2
12	FS440909	SETSCREW – 3/8" – 16NC x 3/8"	1
13	026-3979-021	RING, wear	2
14	026-4142	RING, solid seal	1
15	026-4226	RING, piston	2
16	047-7192-001	RETAINER	2
17	018-0613	SLEEVE	2
18	025-0414-001	ORIFICE	1
19	025-0414-004	ORIFICE	1
20	026-2156-023	O-RING	1
21	026-4181-023	RING, back-up	2
22	047-1520	PLUG, nylon	1
23	FS272200	NUT, hex – 1-1/4" – 12NF	1
24	FS130713	CAPSCREW – 1/4" – 20NC x 1/2"	1
25	053-1581	BAR, lock	1
-	272-0956	KIT, seal (consists of items 7 thru 10, 13, 14, 15, 20 thru 22)	1

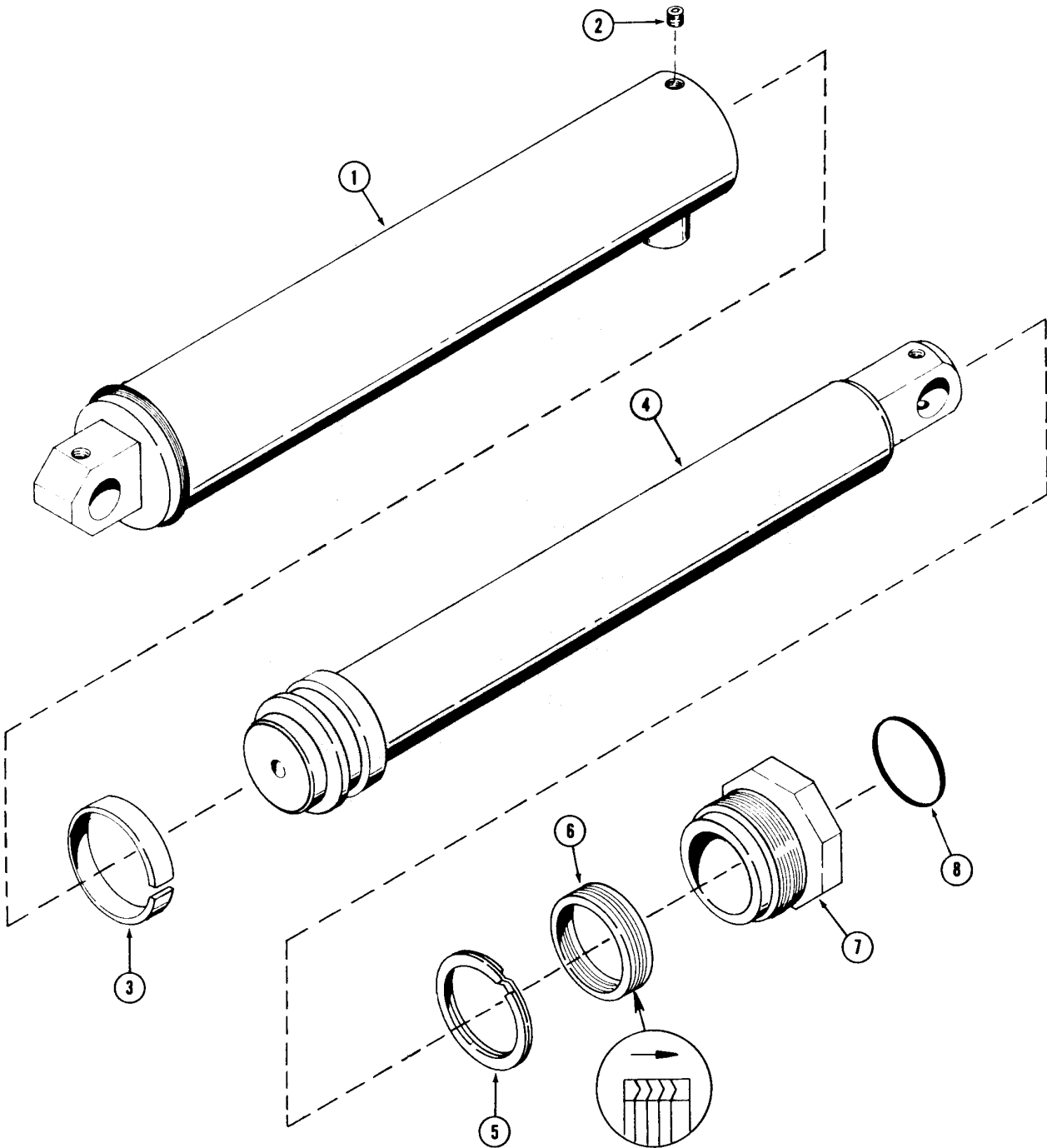
SLIDE CYLINDER 001-4110



SLIDE CYLINDER
001-4110

REF	PART NO.	DESCRIPTION	REQ'D
1	085-0169	BARREL ASSEMBLY	1
2	027-3910	ROD ASSEMBLY	1
3	003-3585	BUSHING	1
4	023-0641	NUT, packing	1
5	023-0477	GLAND, retaining	1
6	023-0640	GLAND, packing	1
7	024-0701	PISTON	1
8	026-2156-026	O-RING	1
9	026-2608-035	O-RING	1
10	026-3977-006	RING, exclusion	1
11	026-3979-017	RING, wear	2
12	026-4186-026	RING, back-up	2
13	026-4200-035	RING, back-up	1
14	026-4149	RING, solid seal	1
15	026-3622	V-RING PACKING	1
16	025-0451-004	ORIFICE	1
17	047-1520	PLUG, nylon	1
18	025-0451-006	ORIFICE	1
19	026-3913	RIGN, piston	2
20	FS440909	SETSCREW – 3/8" – 16NC x 3/8"	1
21	FS272000	NUT, hex – 1-1/4" – 12NC	1
22	047-1792-002	RING, retaining	2
23	018-0747	SLEEVE	2
-	272-0957	KIT, seal (consists of items 8 thru 15, 17, 19, 20)	1

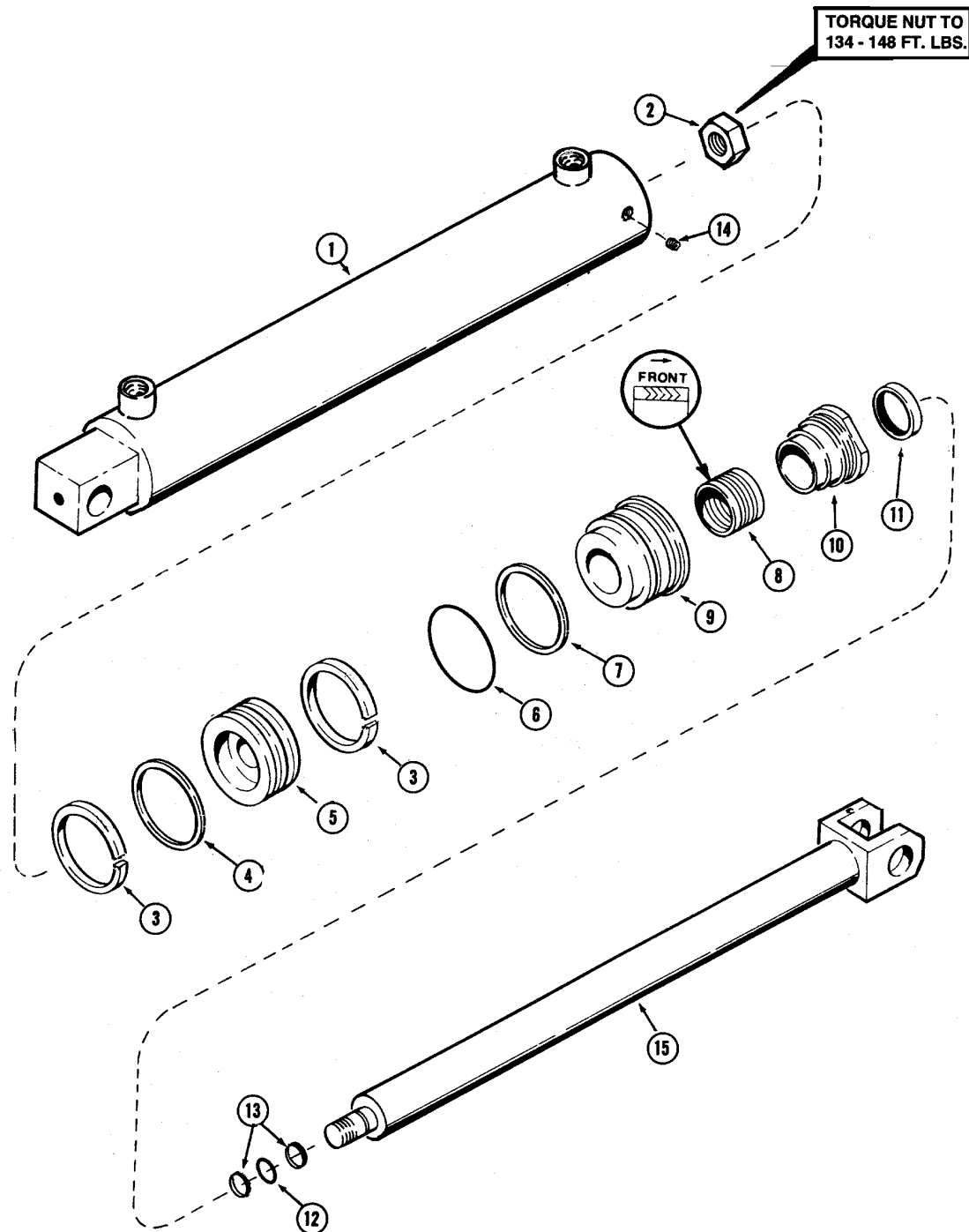
**TAILGATE RAISE CYLINDER
001-4070**



FORMULA 4000**TAILGATE RAISE CYLINDER
001-4070**

REF	PART NO.	DESCRIPTION	REQ'D
1	085-0126	BARREL	1
2	FS440707	SETSCREW – 1/4" – 20NC x 1/4"	1
3	026-3979-001	RING, wear	1
4	027-3783	ROD ASSEMBLY	1
5	026-3718-001	RING, retaining	1
6	022-3379	V-PACKING ASSEMBLY	1
7	023-0636	GLAND, packing	1
8	026-3707-010	RING, wiper	1
-	272-0937	KIT, seal (consists of items 2, 3, 5, 6, 8)	1

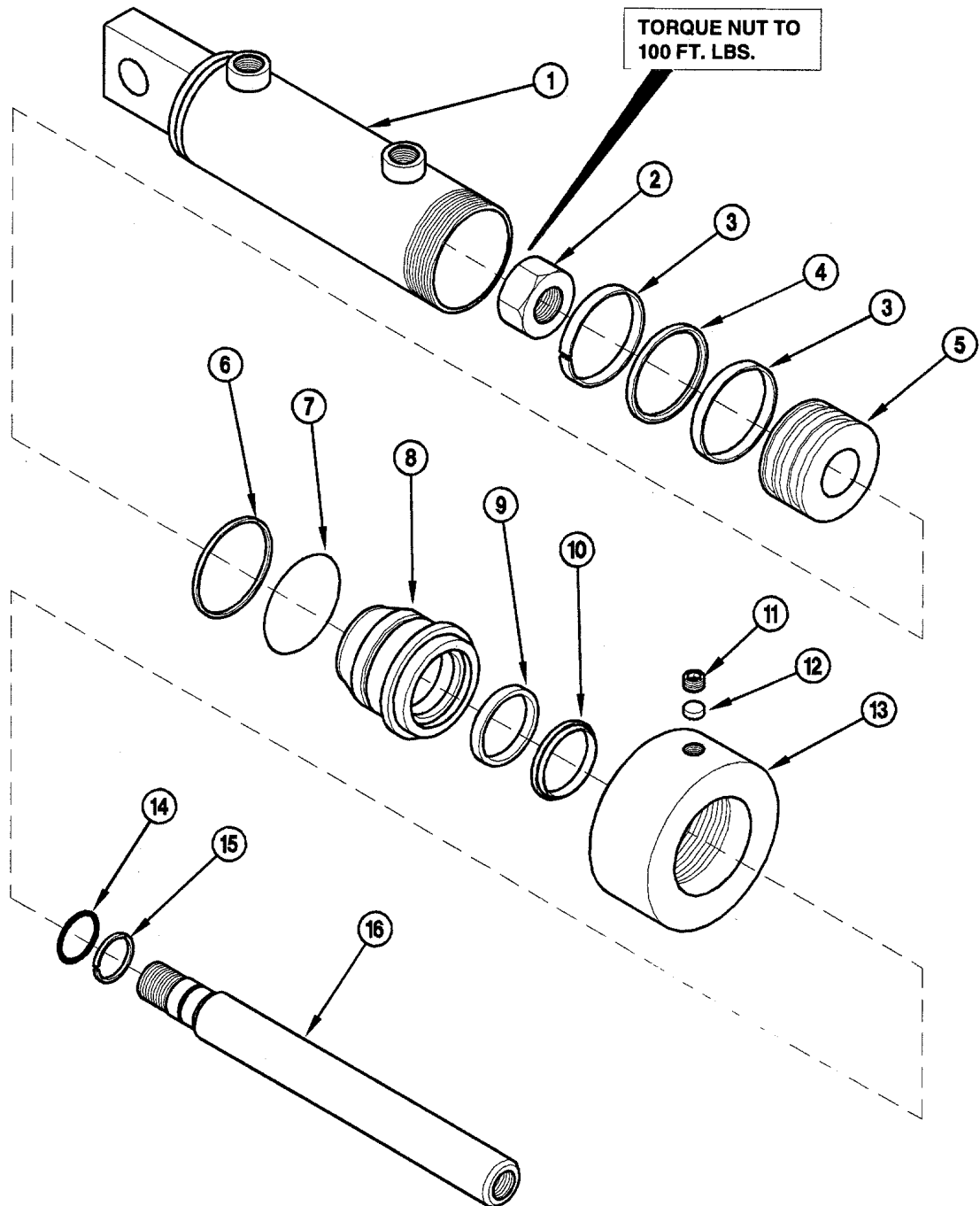
CONTAINER ARM MECHANISM CYLINDER 001-4283



**CONTAINER ARM MECHANISM CYLINDER
001-4283**

REF	PART NO.	DESCRIPTION	REQ'D
1	85-0387	BARREL	1
2	FS271700	NUT, lock – 7/8" – 14NF (torque to 134-148 ft./lbs.)	1
3	26-3979-23	RING, wear	2
4	26-4183	RING, solid seal	1
5	24-0712	PISTON	1
6	26-2608-23	O-RING	1
7	26-4200-23	RING, back-up	1
8	26-3807	V-PACKING (set)	1
9	23-0686	GLAND, packing	1
10	23-0672	NUT, packing	1
11	26-3977-21	WIPER	1
12	26-2156-16	O-RING	1
13	26-4186-16	RING, back-up	2
14	FS440707	SETSCREW	1
15	27-4199	ROD ASSEMBLY	1
-	272-0966	SEAL KIT – consists of items 3, 4, 6, 7, 8, 11 thru 13)	A/R

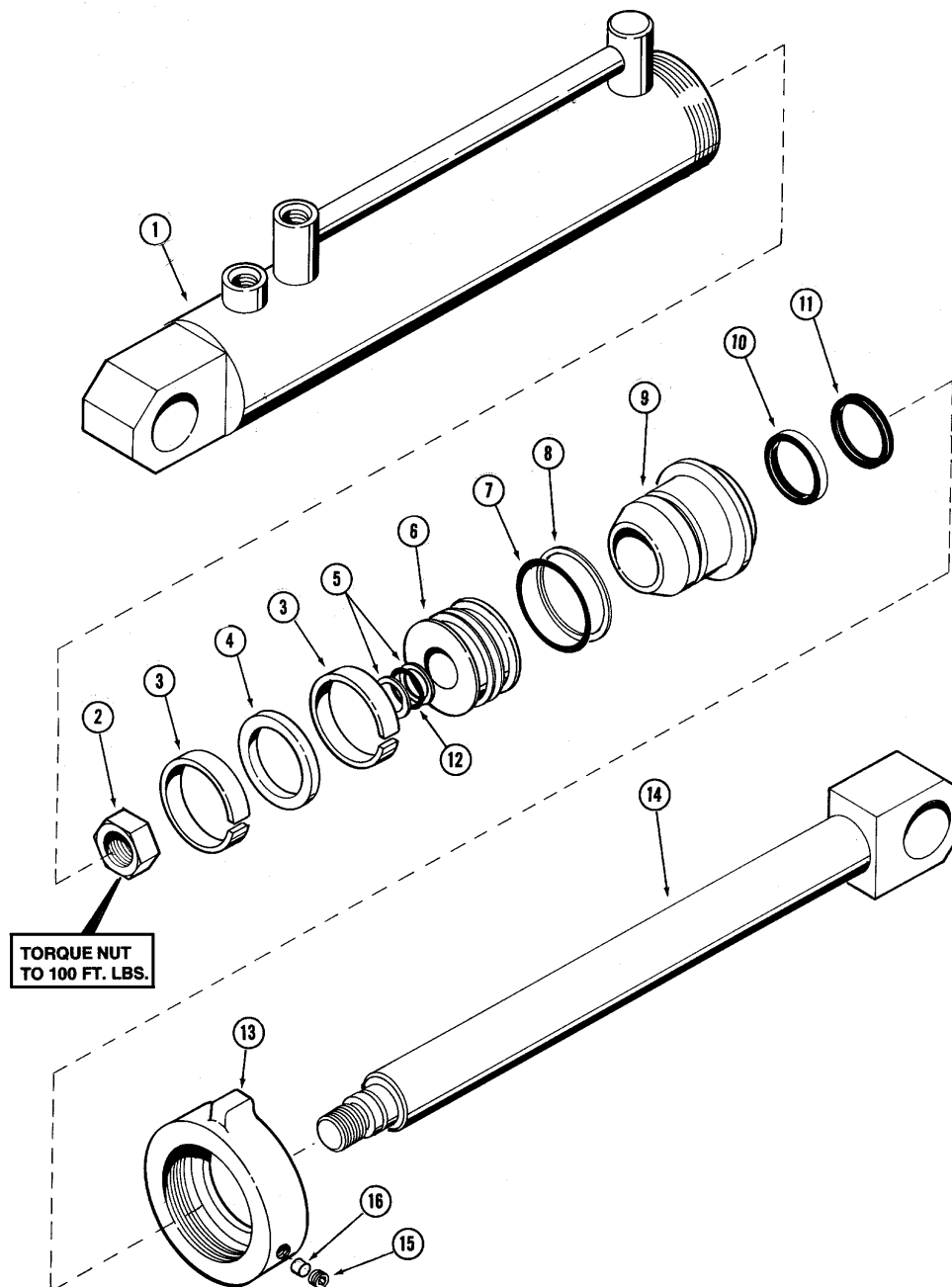
ROLL-BAR FLIPPER CYLINDER 001-5069



**ROLL-BAR FLIPPER CYLINDER
001-5069**

REF	PART NO.	DESCRIPTION	REQ'D
1	001-5069-001	BARREL ASSEMBLY	1
2	FS271700	NUT, hex – 7/8" – 14NC	1
3	026-3979-012	RING, wear	2
4	026-4180	RING, solid seal	1
5	024-0706	PISTON	1
6	026-4200-019	RING, back-up	1
7	026-2608-019	O-RING	1
8	023-0665	GLAND, packing	1
9	026-3980-015	SEAL, single lip	1
10	026-3977-021	WIPER	1
11	FS440909	SETSCREW – 3/8" – 16NC	1
12	047-1520	PLUG, nylon	1
13	023-0694	GLAND, retaining	1
14	026-2156-016	O-RING	1
15	026-4186-016	RING, back-up	1
16	001-5069-002	ROD ASSEMBLY	1
-	272-0958	SEAL KIT, repair (consists of items 3, 4, 6, 7, 9, 10 12, 14, 15)	1

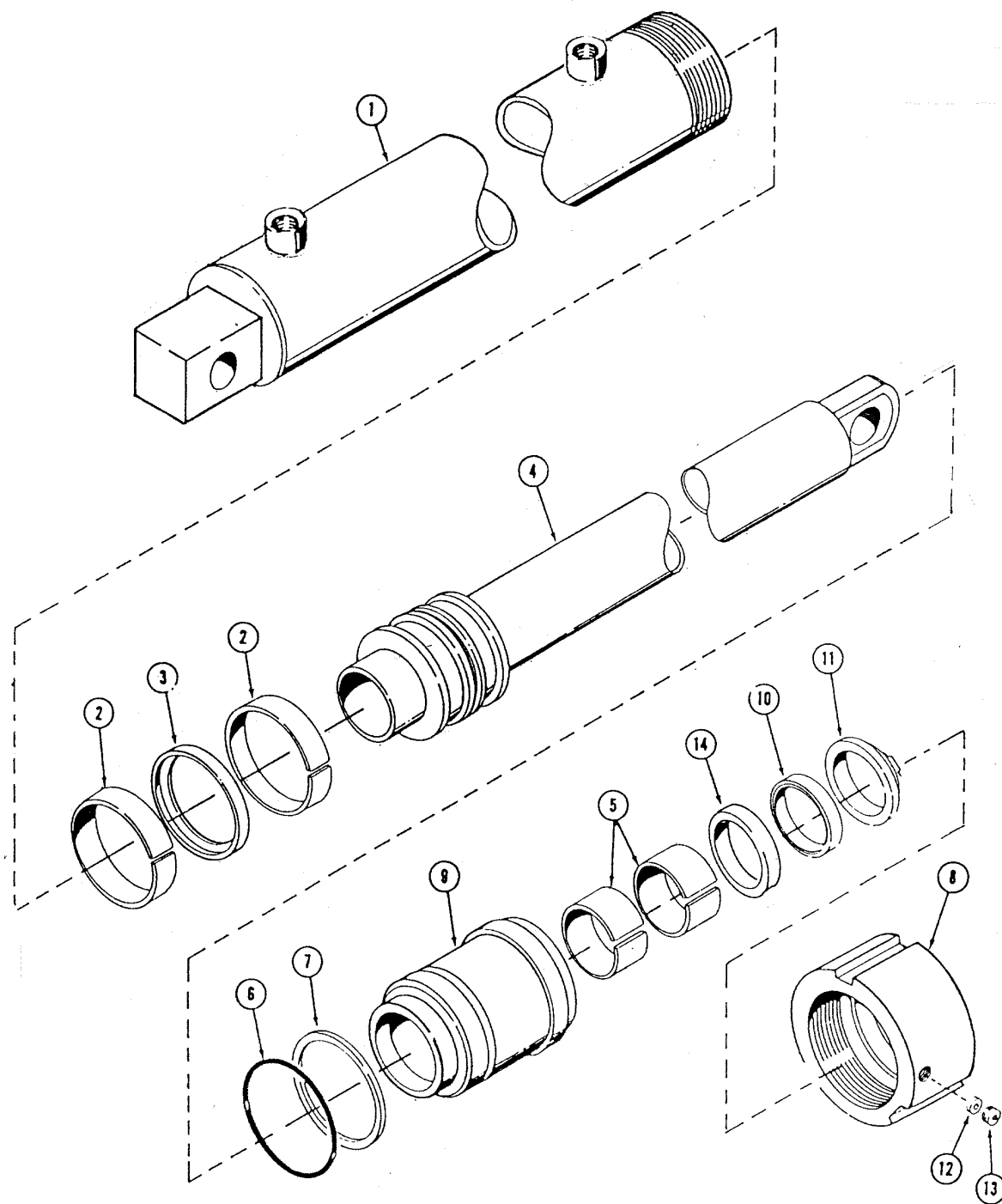
ROLL BAR MECHANISM CYLINDER 001-4105



FORMULA 4000**ROLL BAR MECHANISM CYLINDER
001-4105**

REF	PART NO.	DESCRIPTION	REQ'D
1	085-0168	BARREL	1
2	FS271700	NUT, lock – 7/8" (torque to 100 ft./lbs.)	1
3	026-3979-012	RING, wear	2
4	26-4180	RING, solid seal	1
5	026-4186-016	RING, back-up	2
6	024-0706	PISTON	1
7	026-2608-019	O-RING	1
8	026-4200-019	RING, back-up	1
9	023-0665	GLAND, packing	1
10	026-3980-015	SEAL, rod	1
11	026-3977-021	WIPER	1
12	026-2156-016	O-RING	1
13	023-0664	GLAND, retaining	1
14	027-4176	ROD ASSEMBLY	1
15	FS440909	SETSCREW – 3/8"	1
16	047-1520	SLUG, nylon	1
-	272-0958	SEAL KIT – (consists of items 3, 4, 5, 7 thru 12)	A/R

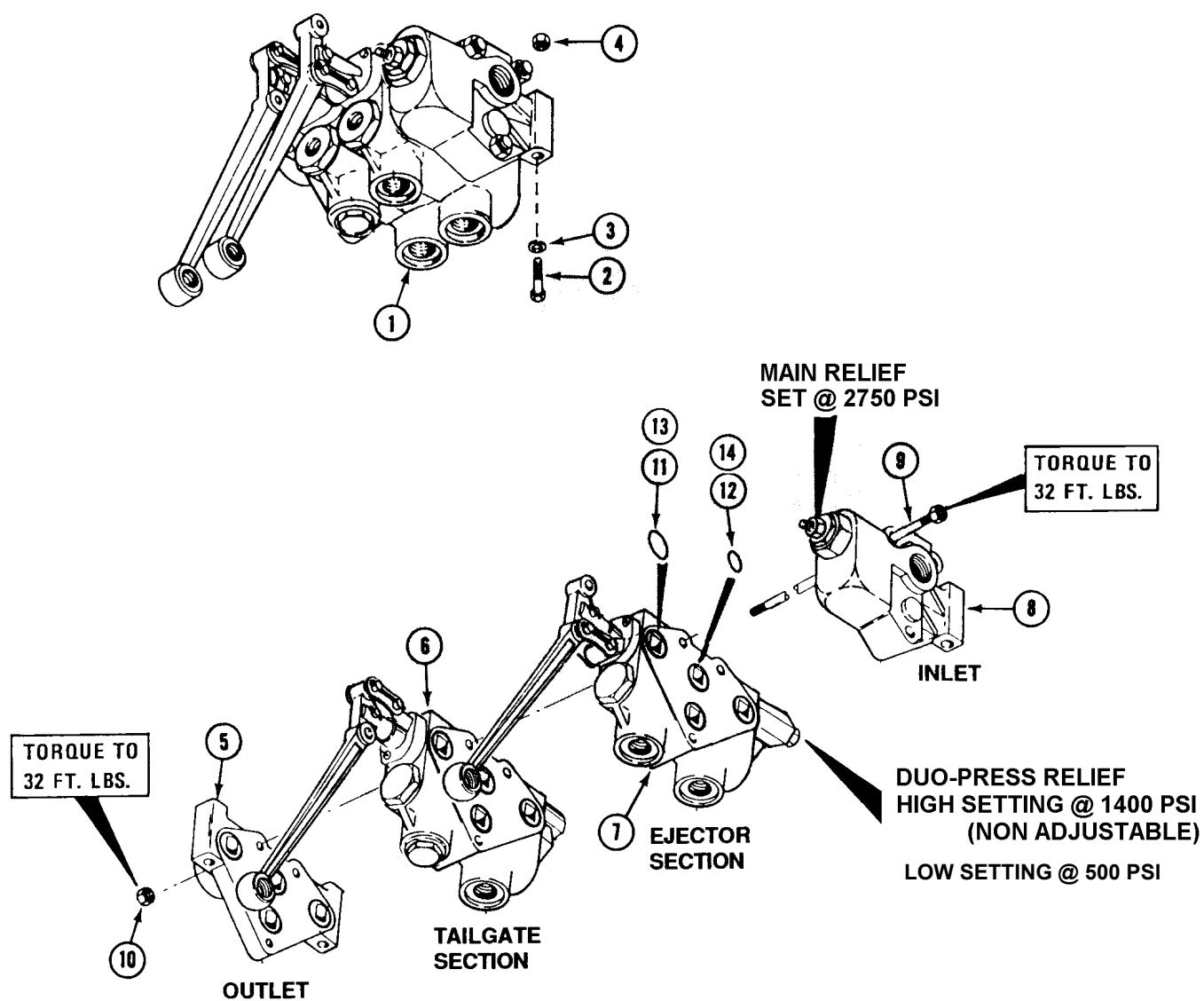
REEVING CYLINDER 001-6061



FORMULA 4000**REEVING CYLINDER
001-6061**

REF	PART NO.	DESCRIPTION	REQ'D
1	001-6061-001	BARREL	1
2	026-3979-008	RING, wear	2
3	026-4141	RING, solid seal	1
4	001-6061-002	PLUNGER ASSEMBLY	1
5	026-4143-007	RING, wear	2
6	026-2608-043	O-RING	1
7	026-4200-043	RING, back-up	1
8	023-0668	GLAND, retaining	1
9	023-0713	GLAND, packing	1
10	026-3980-012	SEAL, single lip	1
11	026-3977-013	WIPER	1
12	047-1520	SLUG, nylon	1
13	FS440909	SETSCREW – 3/8"	2
14	026-4265	RING, buffer	1
-	272-0989	SEAL KIT – (consists of items 2, 3, 5, 6, 7, 10, 11).....	A/R

UNDERBODY CONTROL VALVE for EJECTOR & TAILGATE FUNCTIONS 031-3374

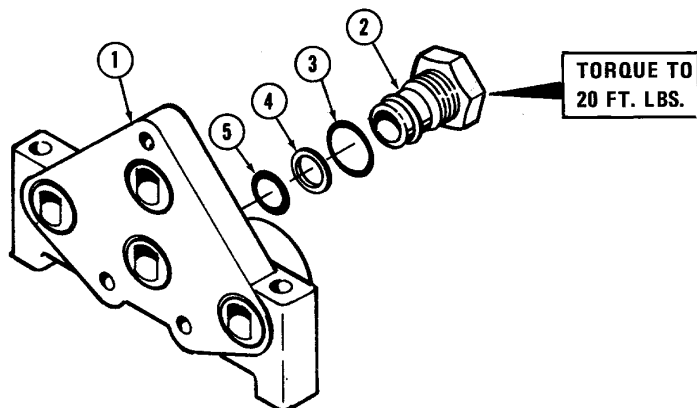


**UNDERBODY CONTROL VALVE for EJECTOR & TAILGATE FUNCTIONS
031-3374**

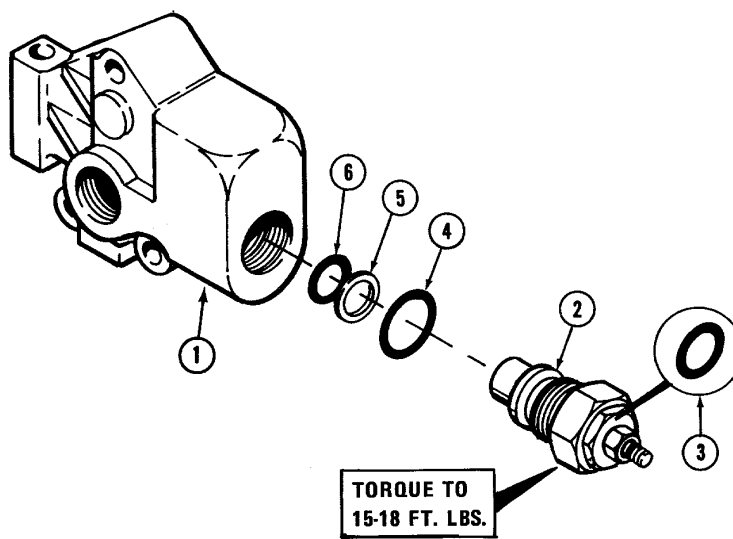
REF	PART NO.	DESCRIPTION	REQ'D
1	031-3285	VALVE, control	1
2	FS070840	CAPSCREW – 5/16" – 18NC x 3"	3
3	FS550800	WASHER, lock – 5/16"	3
4	FS230800	NUT, lock – 5/16" – 18NC	3
5	REF.	OUTLET SECTION (see page 5.29)	1
6	REF.	SECTION, tailgate (see page 5.33)	1
7	REF.	SECTION, ejector (see page 5.31)	1
8	REF.	INLET (see page 5.29)	1
9	031-3285-051	SCREW – 3/8" – 16 x 6"	3
10	031-3285-052	NUT, hex – 3/8" – 16	3
11	031-3285-046	SEAL, o-ring - .926 I.D. (2/section)	6
12	031-3285-047	SEAL, o-ring - .801 I.D. (2/section)	6
13	031-3285-071	SEAL, o-ring - .914 I.D. (2/section)	6
14	031-3285-070	SEAL, o-ring - .799 I.D. (2/section)	6
15	022-3008	WIRE LOCK	1
-	031-3285-048	SEAL KIT (consists of items 11, 12, 13,14 (2 each)	1
-	031-3285-006	STUD KIT (consists of items 9 & 10)	1

INLET and OUTLET SECTIONS 031-3285-001 AND 031-3285-003

OUTLET COVER 31-3285-03



INLET COVER 31-3285-01

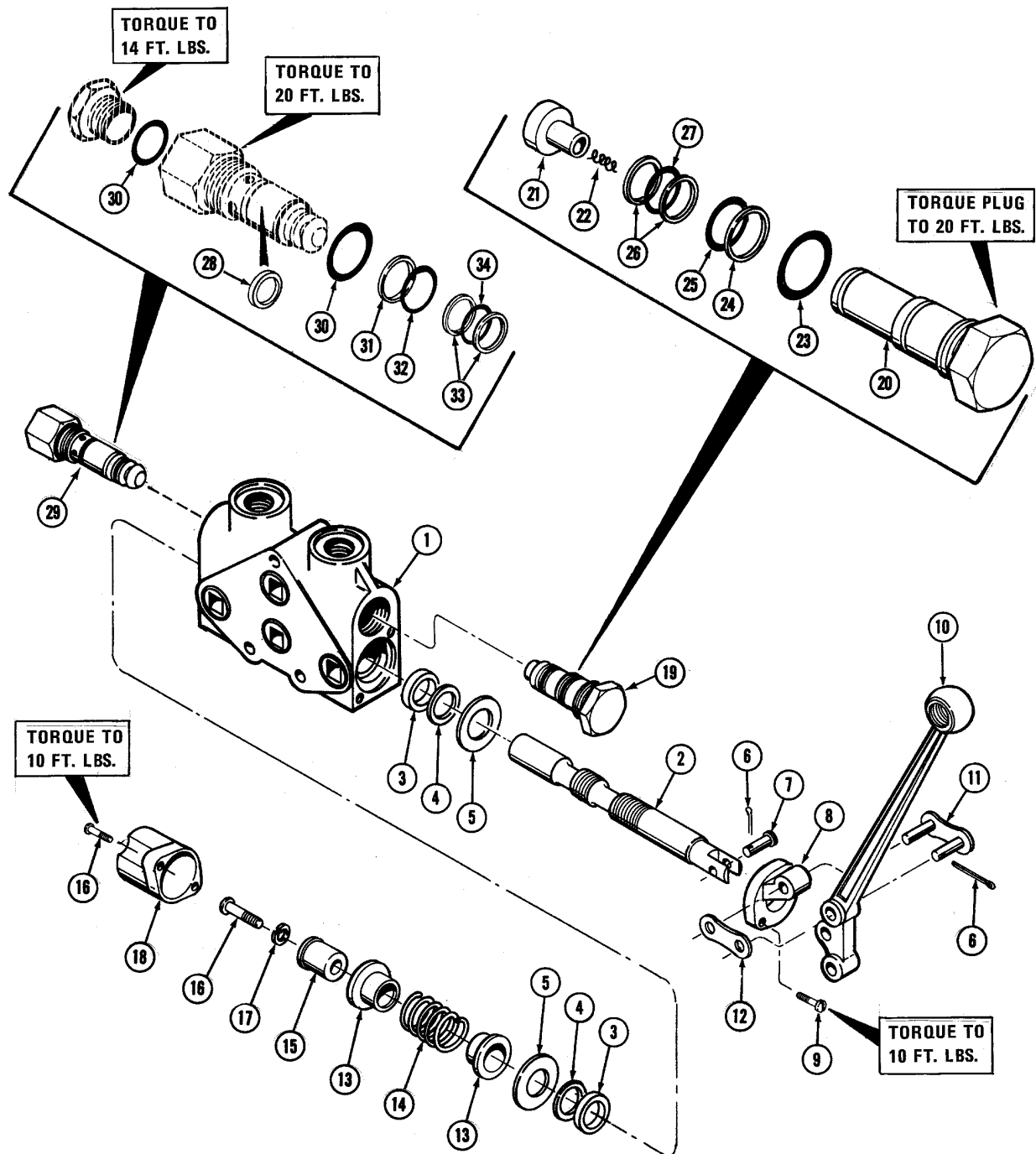


**INLET and OUTLET SECTIONS
031-3285-001 AND 031-3285-003**

REF	PART NO.	DESCRIPTION	REQ'D
OUTLET - 031-3285-003			
1	031-3285-049	COVER.....	1
2	031-3285-005	SLEEVE, power beyond.....	1
3	031-3285-060	SEAL	1
4	031-3285-061	WASHER, back-up	1
5	031-3285-062	SEAL, o-ring	1

REF.	PART NO.	DESCRIPTION	REQ'D
INLET - 031-3285-001			
1	031-3285-007	COVER.....	1
2	031-2979	RELIEF, main	1
3	031-3285-055	SEAL, o-ring	1
4	031-3285-056	SEAL, o-ring	1
5	031-3285-057	RING, back-up	1
6	011-5093	SEAL, o-ring	1
-	207-6103	SEAL KIT – (consists of items 3 thru 6).....	1

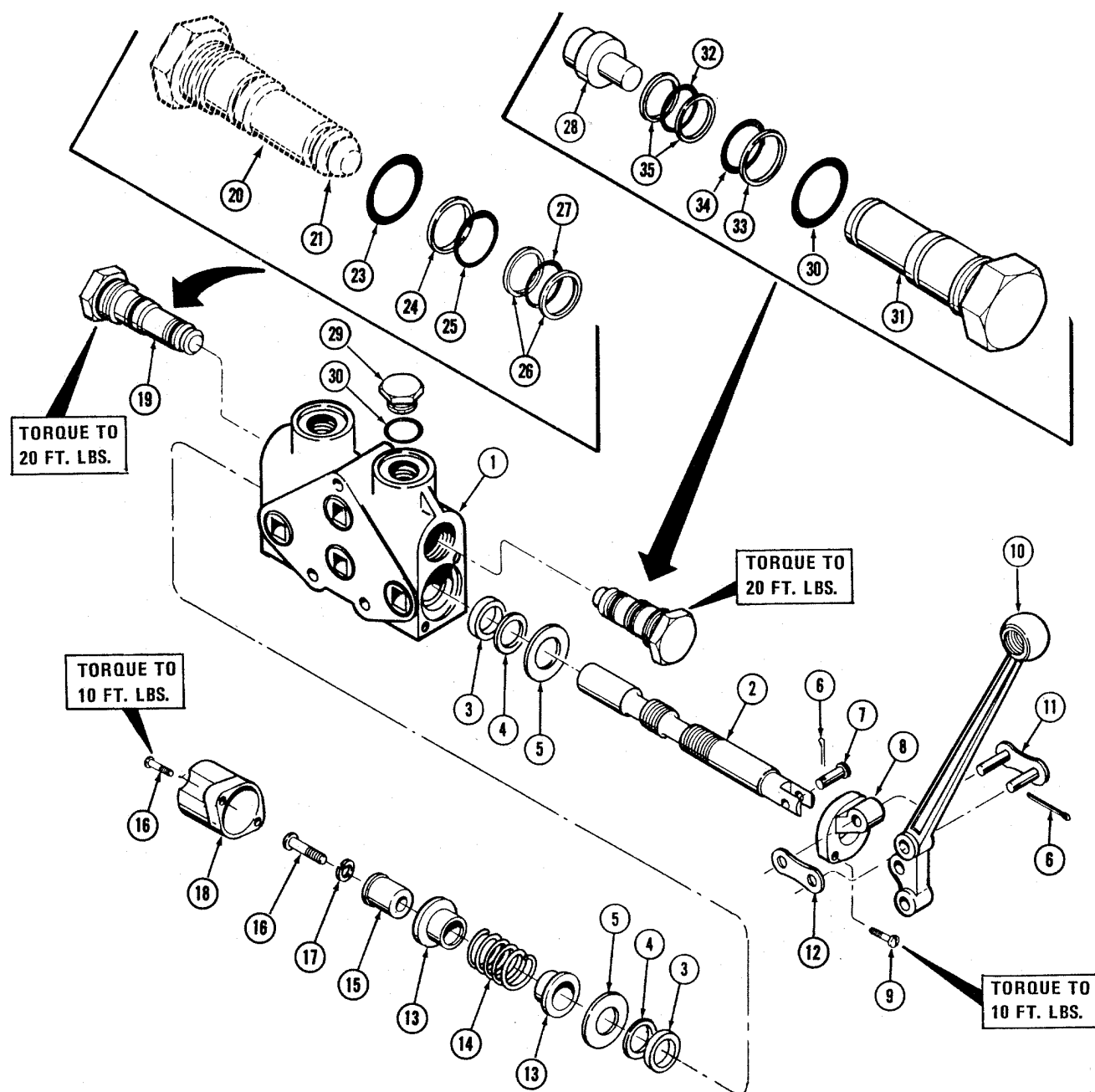
WORKING VALVE SECTION for EJECTOR FUNCTION 031-3285-002



**WORKING VALVE SECTION for EJECTOR FUNCTION
031-3285-002**

REF	PART NO.	DESCRIPTION	REQ'D
-	031-3285-002	VALVE SECTION – (consists of items 1 thru 28)	1
1	031-3285-011	HOUSING	1
2	031-3285-012	SPOOL	1
3	031-3285-016	SEAL, spool (see kit A)	2
4	207-6034	WASHER, back-up (see kit A)	2
5	207-6035	WASHER, retainer plate	2
-	031-3285-015	HANDLE ASSEMBLY (includes items 6 thru 12)	1
6	031-3285-036	PIN, cotter	3
7	207-5544	PIN	1
8	207-5540	BRACKET	1
9	031-3285-035	CAPSCREW – 1/4" – 20NC x 7/8"	2
10	207-5541	HANDLE	1
11	031-2041-051	LINK	1
12	031-2041-019	PLATE, link	1
-	031-3285-013	POSITIONER, spool (includes items 13 thru 18)	1
13	207-5534	COLLAR, spring	2
14	031-3285-017	SPRING	1
15	031-3285-020	COLLAR, spool	1
16	031-3285-021	CAPSCREW	3
17	031-3285-022	WASHER, lock	2
18	207-5533	BONNET	1
19	031-3285-014	PLUG, load check (consists of items 20 thru 27)	1
20	031-3285-023	PLUG	1
21	031-3285-024	POPPET	1
22	031-3285-025	SPRING	1
23	026-2292-006	SEAL, o-ring (see kit C)	1
24	207-5521	WASHER, back-up (outer) (see kit C)	1
25	031-3285-029	SEAL, back-up (outer) (see kit C)	1
26	031-3285-030	WASHER, back-up (inner) (see kit C)	2
27	031-3285-031	SEAL, o-ring (see kit C)	1
28	031-2940-005	RING, piston	1
29	031-3290	VALVE, duo-press relief - (non adjustable) – (includes items 30 thru 34) order separately-not part of valve	1
30	26-2292-006	SEAL, o-ring (see kit B)	2
31	207-5521	WASHER, back-up (outer) (see kit B)	1
32	031-3285-029	SEAL, o-ring (see kit B)	1
33	031-3285-030	WASHER, back-up (inner) (see kit B)	2
34	031-3285-031	SEAL, o-ring (see kit B)	1
A	031-3285-041	SEAL KIT (consists of items 3, 4)	A/R
B	031-2940-006	SEAL KIT (consists of items 30 thru 34)	A/R
C	031-3285-026	SEAL KIT (consists of items 23 thru 27)	A/R

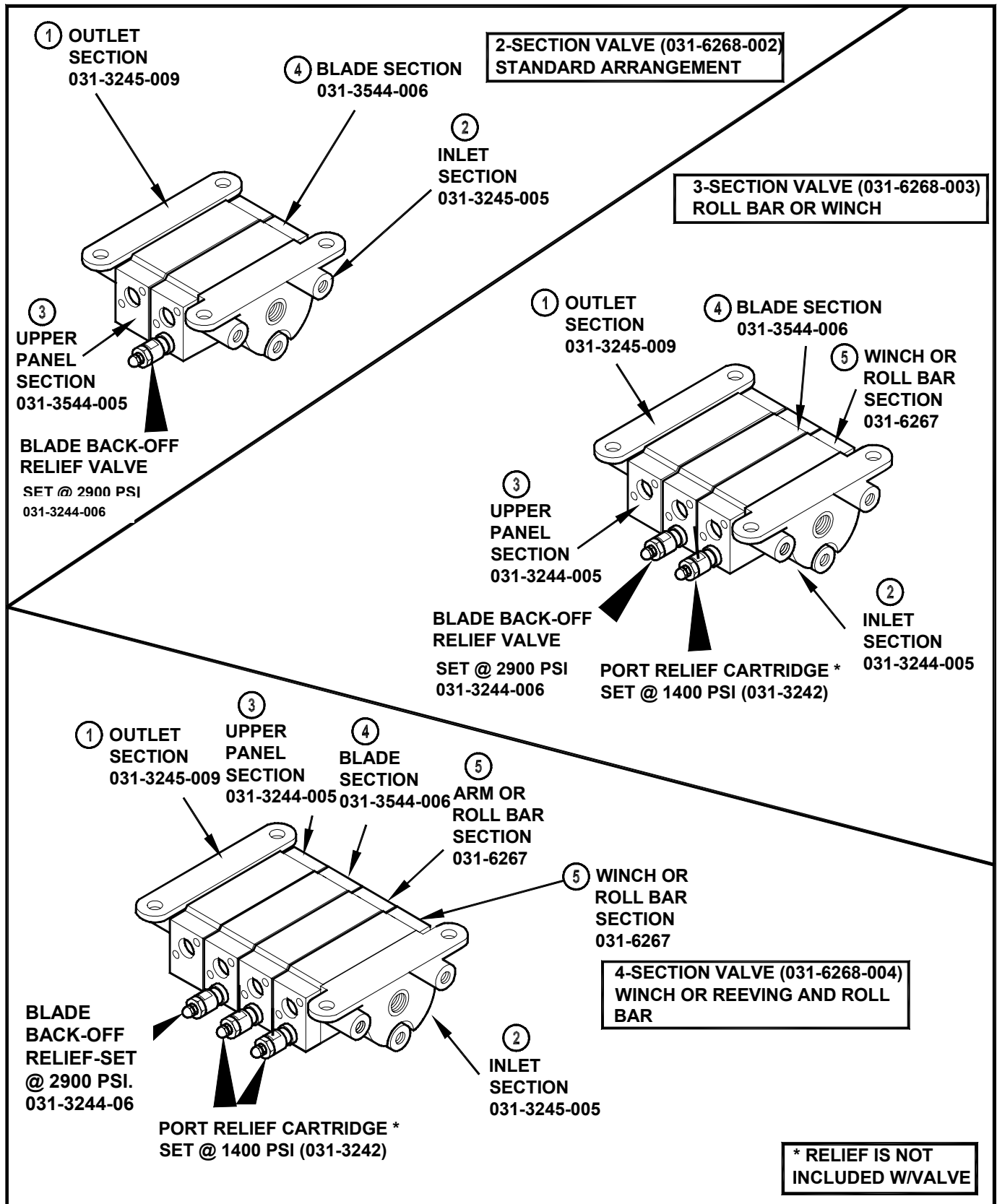
WORKING VALVE SECTION for TAILGATE FUNCTION 031-3374-001



**WORKING VALVE SECTION for TAILGATE FUNCTION
031-3374-001**

REF	PART NO.	DESCRIPTION	REQ'D
1	031-3285-011	HOUSING.....	1
2	031-3285-042	SPOOL (must be ordered as set with housing).....	1
3	031-3285-016	SEAL, spool (see kit A).....	2
4	207-6034	WASHER, back-up (see kit A).....	2
5	207-6035	WASHER, retainer plate.....	2
-	031-3285-015	HANDLE ASSEMBLY (includes items 6 thru 12).....	1
6	031-3285-036	PIN, cotter.....	3
7	207-5544	PIN.....	1
8	207-5540	BRACKET.....	1
9	031-3285-035	CAPSCREW – 1/4" – 20NC x 7/8".....	2
10	207-5541	HANDLE.....	1
11	031-2041-051	LINK.....	1
12	031-2041-019	PLATE, link.....	1
-	031-3285-013	POSITIONER, spool (includes items 13 thru 18).....	1
13	207-5534	COLLAR, spring.....	2
14	031-3285-017	SPRING.....	1
15	031-3285-020	COLLAR, spool.....	1
16	031-3285-021	CAPSCREW.....	3
17	031-3285-022	WASHER, lock.....	2
18	207-5533	BONNET.....	1
19	031-3285-014	PLUG, load check (consists of items 20 thru 27).....	1
20	031-3285-023	PLUG.....	1
21	031-3285-024	POPPET.....	1
22	031-3285-025	SPRING.....	1
23	026-2292-006	SEAL, o-ring (see kit C).....	1
24	207-5521	WASHER, back-up (outer) (see kit C).....	1
25	031-3285-029	SEAL, back-up (outer) (see kit C).....	1
26	031-3285-030	WASHER, back-up (inner) (see kit C).....	2
27	031-3285-031	SEAL, o-ring (see kit C).....	1
28	031-3285-045	PLUG, 3-way.....	1
29	031-3285-044	PLUG (SAE #10).....	1
30	026-2292-006	SEAL, o-ring (see kit B).....	2
31	031-3285-043	PLUG, check.....	1
32	031-3285-031	SEAL, o-ring (see kit B).....	1
33	207-5521	WASHER, back-up (outer) (see kit B).....	1
34	031-3285-029	SEAL, o-ring (see kit B).....	1
35	031-3285-030	WASHER, back-up (inner) (see kit B).....	2
A	031-3285-041	SEAL KIT (consists of items 3, 4).....	A/R
B	031-2940-006	SEAL KIT (consists of items 30, 32 thru 35).....	A/R
C	031-3285-026	SEAL KIT (consists of items 23 thru 27).....	A/R

TAILGATE (SECONDARY) VALVE **031-6268-002, -003, -004**

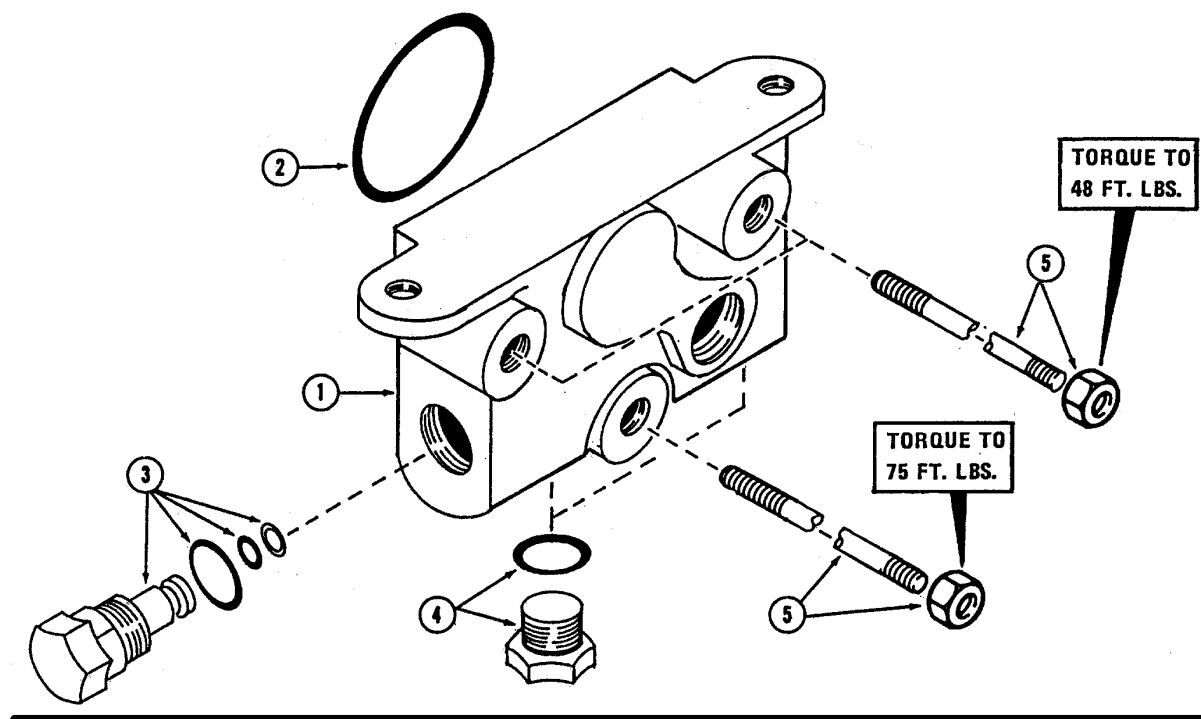


**TAILGATE (SECONDARY) VALVE
031-6268-002, -003, -004**

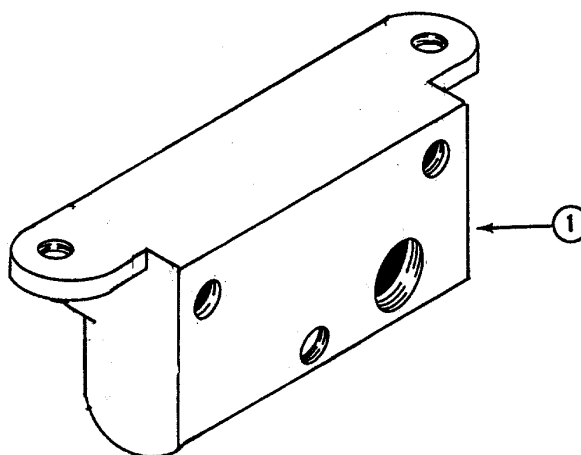
REF	PART NO.	DESCRIPTION	REQ'D
1	031-3245-009	SECTION, outlet (see page 5.33)	1
2	031-3245-005	SECTION, inlet (see page 5.33)	1
3	031-3544-005	SECTION, working (see page 5.35)	1
4	031-3544-006	SECTION, working (see page 5.37)	1
5	031-6267	SECTION, working (see page 5.39)	A/R

**COMPLETE SECTIONED VALVES 031-6268-002, 003, 004
INCLUDE ALL ITEMS SHOWN ON PAGE 5.28 PLUS
THE MOUNTING TIE RODS.**

INLET SECTION with PLUGS and TIE RODS
31-3245-05



OUTLET SECTION
31-3245-09



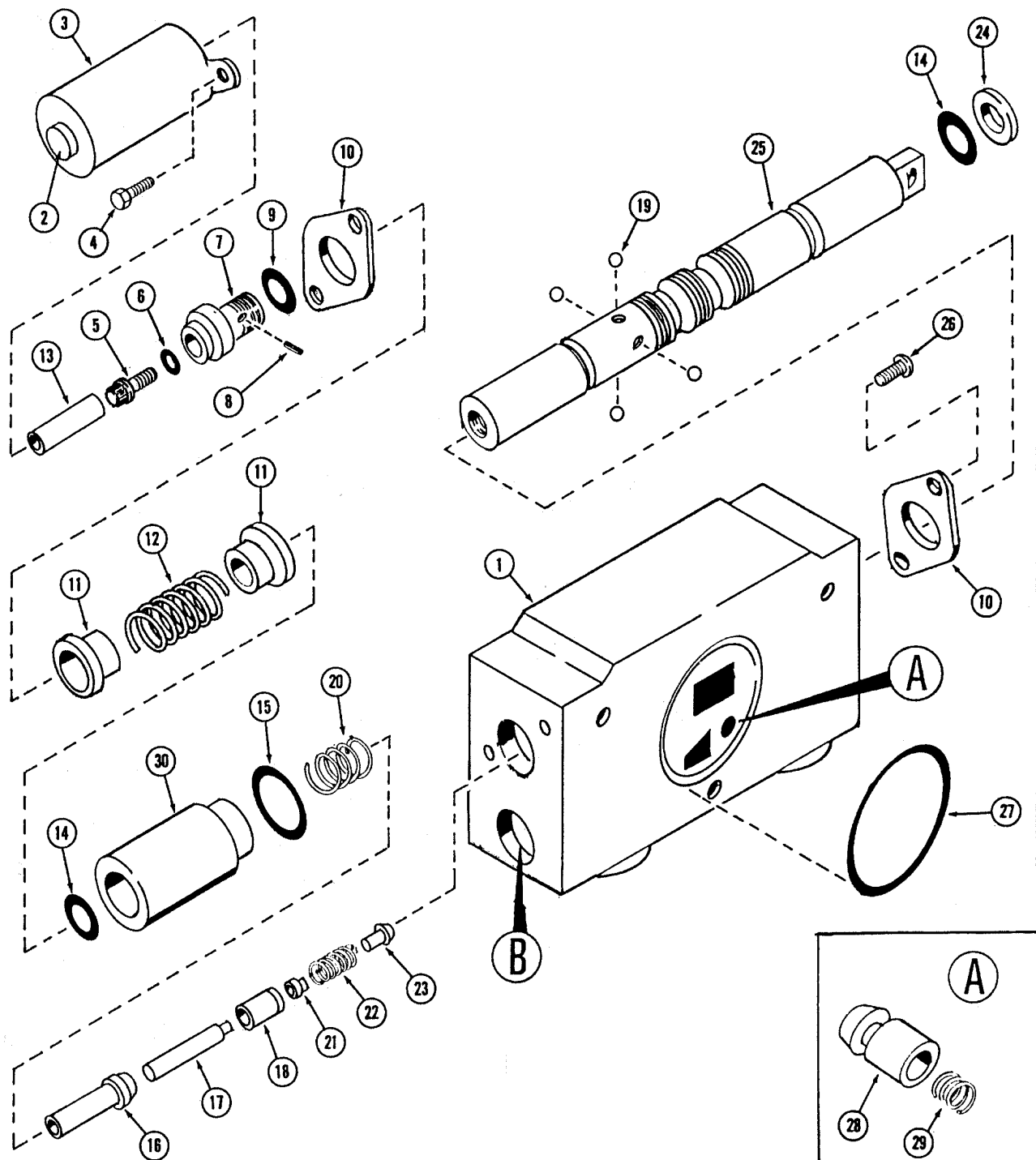
**INLET SECTION with PLUGS and TIE RODS
31-3245-05**

REF	PART NO.	DESCRIPTION	REQ'D
1	NSS	HOUSING (part of inlet section)	1
2	31-3245-10	O-RING (part of inlet section)	1
3	31-3271	PLUG, shut-off (includes o-ring)	1
4	31-2018-10	PLUG (includes o-ring).....	2
5	27-4680	TIE ROD ASSEMBLY (includes rods and nuts) for 2-spool valve.....	1
	27-4678	TIE ROD ASSEMBLY (includes rods and nuts) for 3-spool valve.....	1
	27-4679	TIE ROD ASSEMBLY (includes rods and nuts) for 4-spool valve.....	1

**OUTLET SECTION
31-3245-09**

REF	PART NO.	DESCRIPTION	REQ'D
1	31-3245-09	OUTLET SECTION.....	1

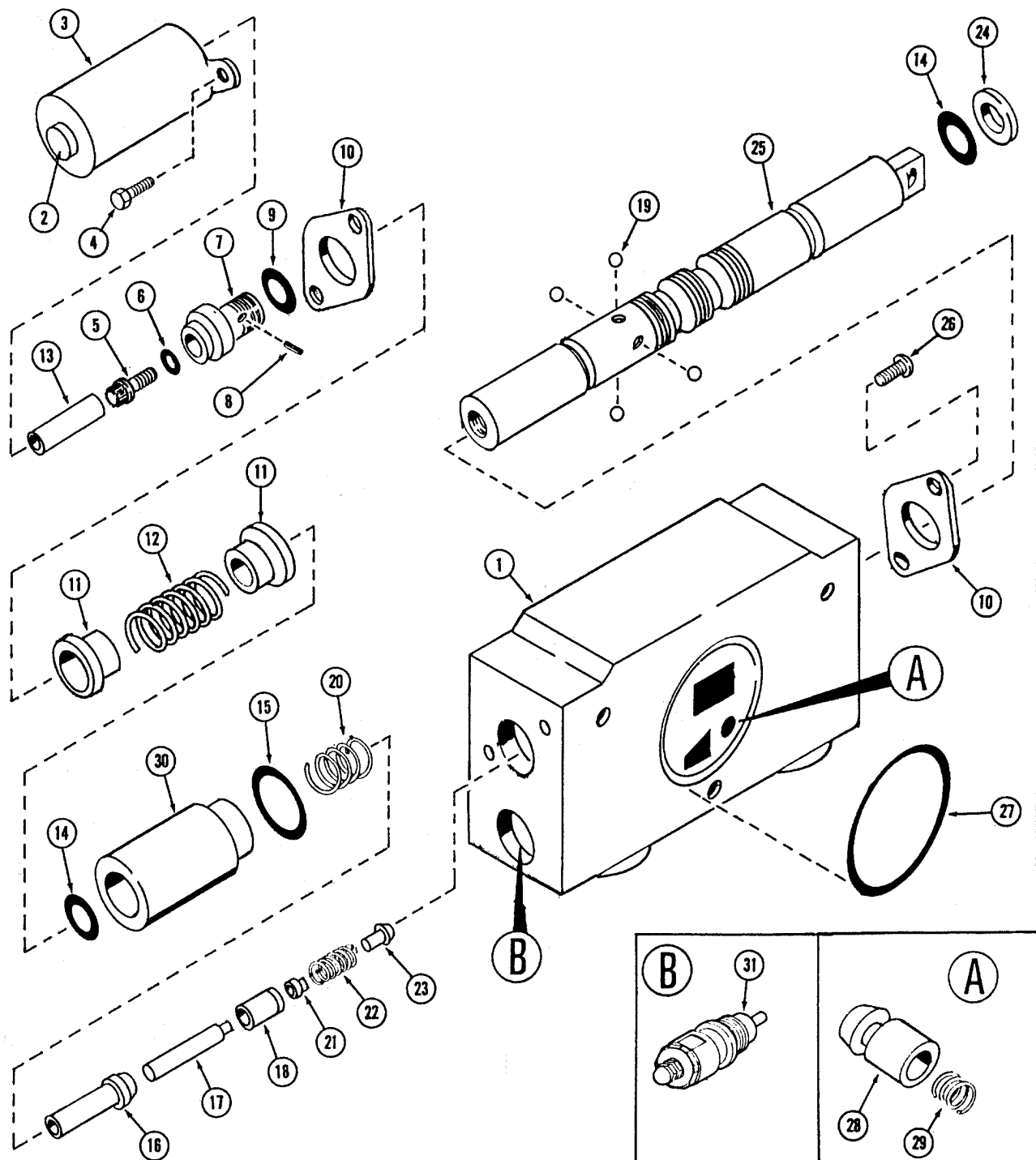
TAILGATE VALVE WORKING SECTION for SLIDE FUNCTION
031-3544-005



TAILGATE VALVE WORKING SECTION for SLIDE FUNCTION
031-3544-005

REF	PART NO.	DESCRIPTION	REQ'D
1	NSS	BODY	1
2	031-2012-013	PLUG	1
3	031-2012-012	CAP, spool	1
4	031-2012-015	CAPSCREW	2
5	031-2012-010	SCREW, adjusting	1
6	031-2012-008	O-RING	1
7	031-2018-003	END, spool	1
8	031-2909-008	INSERT, locking	1
9	031-2018-004	O-RING	1
10	031-2012-004	PLATE, seal	2
11	031-2018-021	SEAT, spring	2
12	031-3544-007	SPRING	1
13	031-2012-016	SPACER	1
14	031-2012-001	O-RING	2
15	031-2909-003	O-RING	1
16	031-2018-018	CAM, detent	1
17	031-2928-011	ROD, adjusting	1
18	031-2928-014	SLEEVE	1
19	031-2012-002	BALL	4
20	031-2928-002	SPRING	1
21	031-2928-013	GUIDE, spring	1
22	031-3217-001	SPRING	1
23	031-2928-012	POPPET	1
24	031-2012-007	WIPER	1
25	NSS	SPOOL (see kit)	1
26	031-2012-006	SCREW, machine	2
27	031-3245-010	O-RING	1
28	031-3245-016	POPPET	1
29	031-3245-014	SPRING	1
30	031-2909-001	SLEEVE, detent	1
-	272-3861	KIT, spool (consists of items 5 thru 11, 14 thru 25, 30).....	1

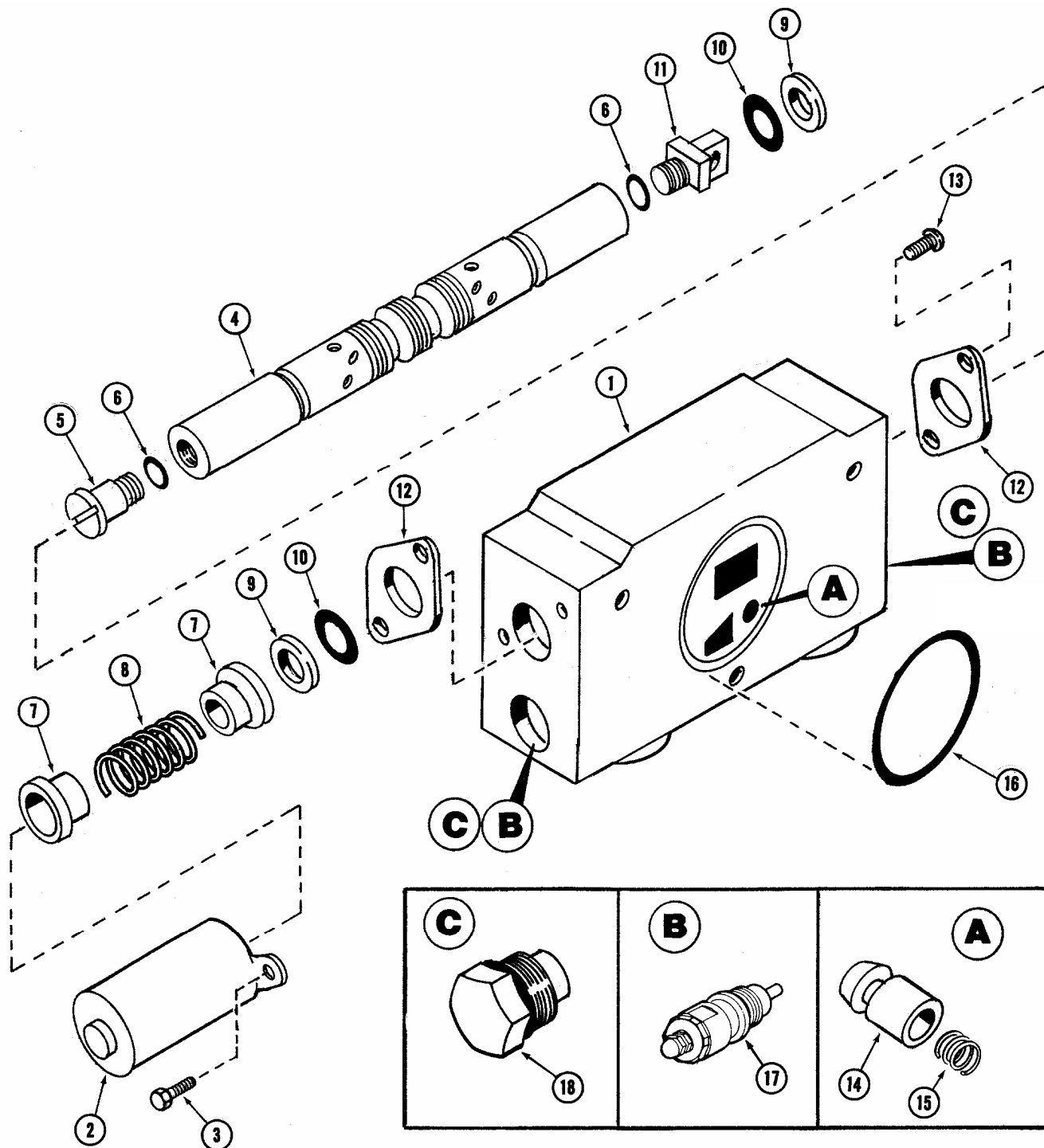
TAILGATE VALVE WORKING SECTION for BLADE FUNCTION **031-3544-006**



**TAILGATE VALVE WORKING SECTION for BLADE FUNCTION
031-3544-006**

REF	PART NO.	DESCRIPTION	REQ'D
1	NSS	BODY	1
2	031-2012-013	PLUG	1
3	031-2012-012	CAP, spool	1
4	031-2012-015	CAPSCREW	2
5	031-2012-010	SCREW, adjusting	1
6	031-2012-008	O-RING	1
7	031-2018-003	END, spool	1
8	031-2909-008	INSERT, locking	1
9	031-2018-004	O-RING	1
10	031-2012-004	PLATE, seal	2
11	031-2018-021	SEAT, spring	2
12	031-3544-007	SPRING	1
13	031-2012-016	SPACER	1
14	031-2012-001	O-RING	2
15	031-2909-003	O-RING	1
16	031-2018-018	CAM, detent	1
17	031-2928-011	ROD, adjusting	1
18	031-2928-014	SLEEVE	1
19	031-2012-002	BALL	4
20	031-2928-002	SPRING	1
21	031-2928-013	GUIDE, spring	1
22	031-3217-001	SPRING	1
23	031-2928-012	POPPET	1
24	031-2012-007	WIPER	1
25	NSS	SPOOL (see kit)	1
26	031-2012-006	SCREW, machine	2
27	031-3245-010	O-RING	1
28	031-3245-016	POPPET	1
29	031-3245-014	SPRING	1
30	031-2909-001	SLEEVE, detent	1
31	031-3244-006	VALVE, relief (set @ 2900 PSI) (ORDER SEPERATELY – NOT PART OF VALVE	1
-	272-3861	KIT, spool (consists of items 5 thru 11, 14 thru 25, 30).....	1

**TAILGATE VALVE WORKING SECTION for
ARM, WINCH, ROLL BAR or REEVING MECHANISM
031-6267**



**TAILGATE VALVE WORKING SECTION for
ARM, WINCH, ROLL BAR or REEVING MECHANISM
031-6267**

REF	PART NO.	DESCRIPTION	REQ'D
1	NSS	BODY	1
2	031-2012-003	CAP, spool	1
3	031-2012-005	CAPSCREW	2
4	NSS	SPOOL (see kit).....	1
5	031-2018-013	END, spool.....	1
6	031-2018-004	O-RING	2
7	031-2018-021	SEAT, spring.....	2
8	031-3217-001	SPRING	1
9	031-2012-007	WIPER	2
10	031-2012-001	O-RING	2
11	031-3245-018	END, tang	1
12	031-2012-004	PLATE, seal	2
13	031-2012-006	SCREW, machine.....	2
14	031-3245-016	POPPET	1
15	031-3245-014	SPRING	1
16	031-3245-010	O-RING	1
17	031-3242	CARTRIDGE, relief – set @ 1400 PSI (NOT PART OF SECTION)....	1
18	025-0472	PLUG	A/R

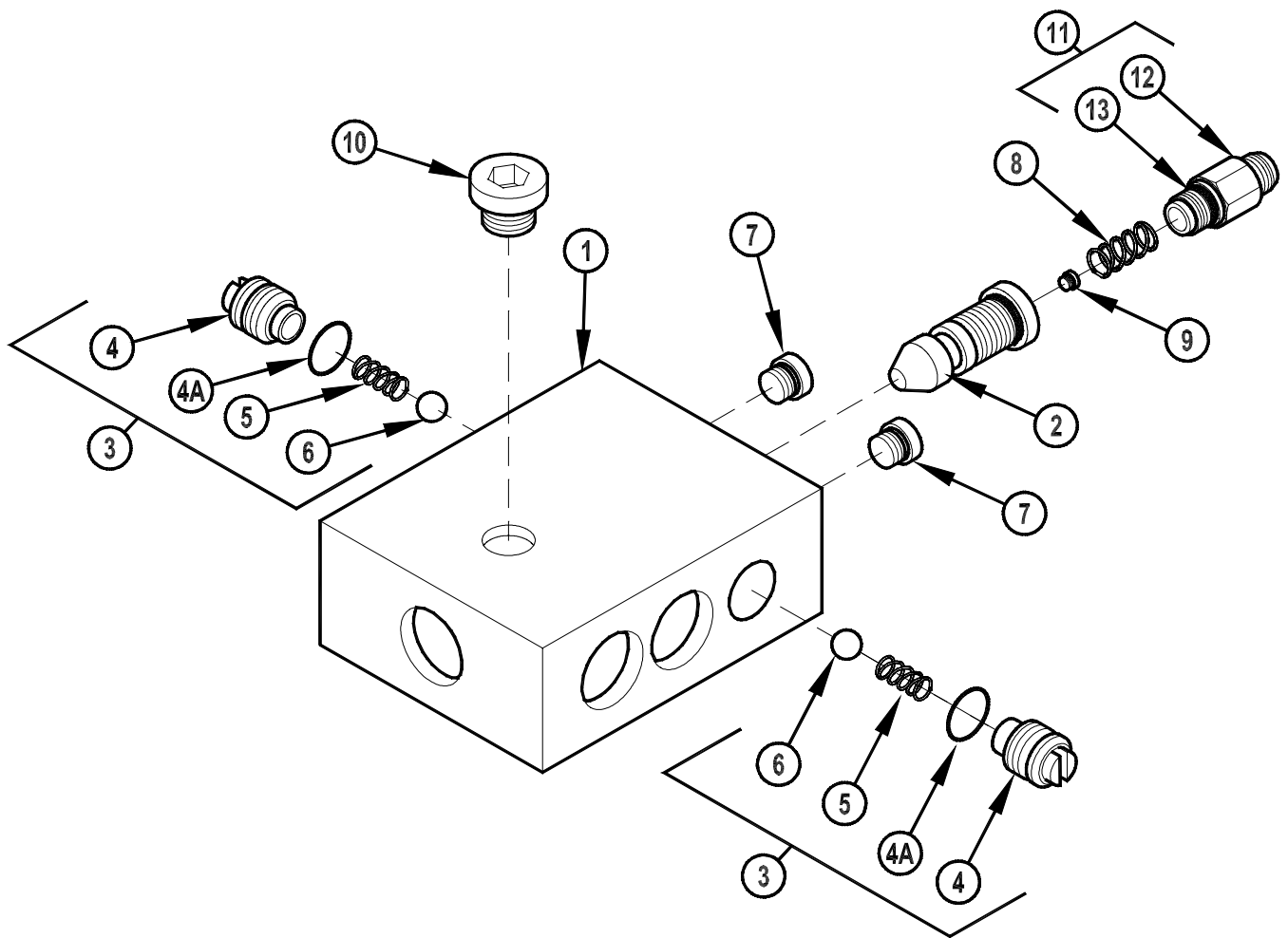
-	372-1434	SPOOL KIT (consists of items 4 thru 12).....	1
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**UNITS WITH ROLL BAR, OR ARM MECHANISM USE
1 RELIEF (31-3242) AND 1 PLUG (25-0472)**

UNITS WITH WINCH USE 2 RELIEFS (31-3242)

NO RELIEFS USED WITH REEVING MECHANISM.

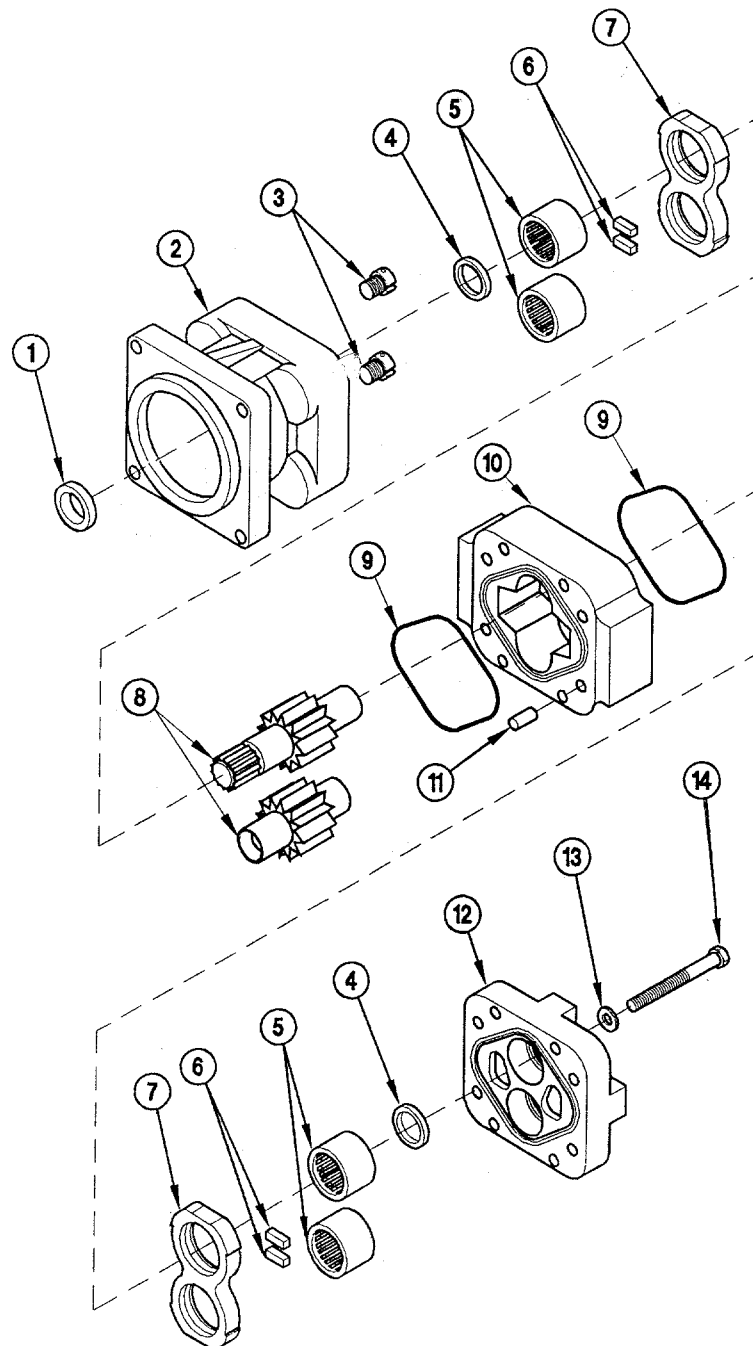
REGENERATIVE VALVE 031-6285



**REGENERATIVE VALVE
031-6285**

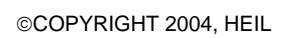
REF	PART NO.	DESCRIPTION	REQ'D
1	NSS	MANIFOLD.....	1
2	031-6285-001	SPOOL	1
3	031-6285-002	VALVE, check	2
4	NSS	PLUG, retaining.....	1
4A	031-6285-008	O-RING	1
5	NSS	BALL.....	1
6	NSS	SPRING.....	1
7	031-6272-002	PLUG.....	2
8	031-6285-004	SPRING.....	1
9	031-6285-005	PLUG.....	1
10	031-2685-006	PLUG.....	1
11	031-6285-007	PLUG ASSEMBLY, retaining.....	1
12	NSS	PLUG.....	1
13	031-6285-009	O-RING	1

HYDRAULICE PUMP – DIRECT MOUNT 219-1915



**HYDRAULICE PUMP – DIRECT MOUNT
219-1915**

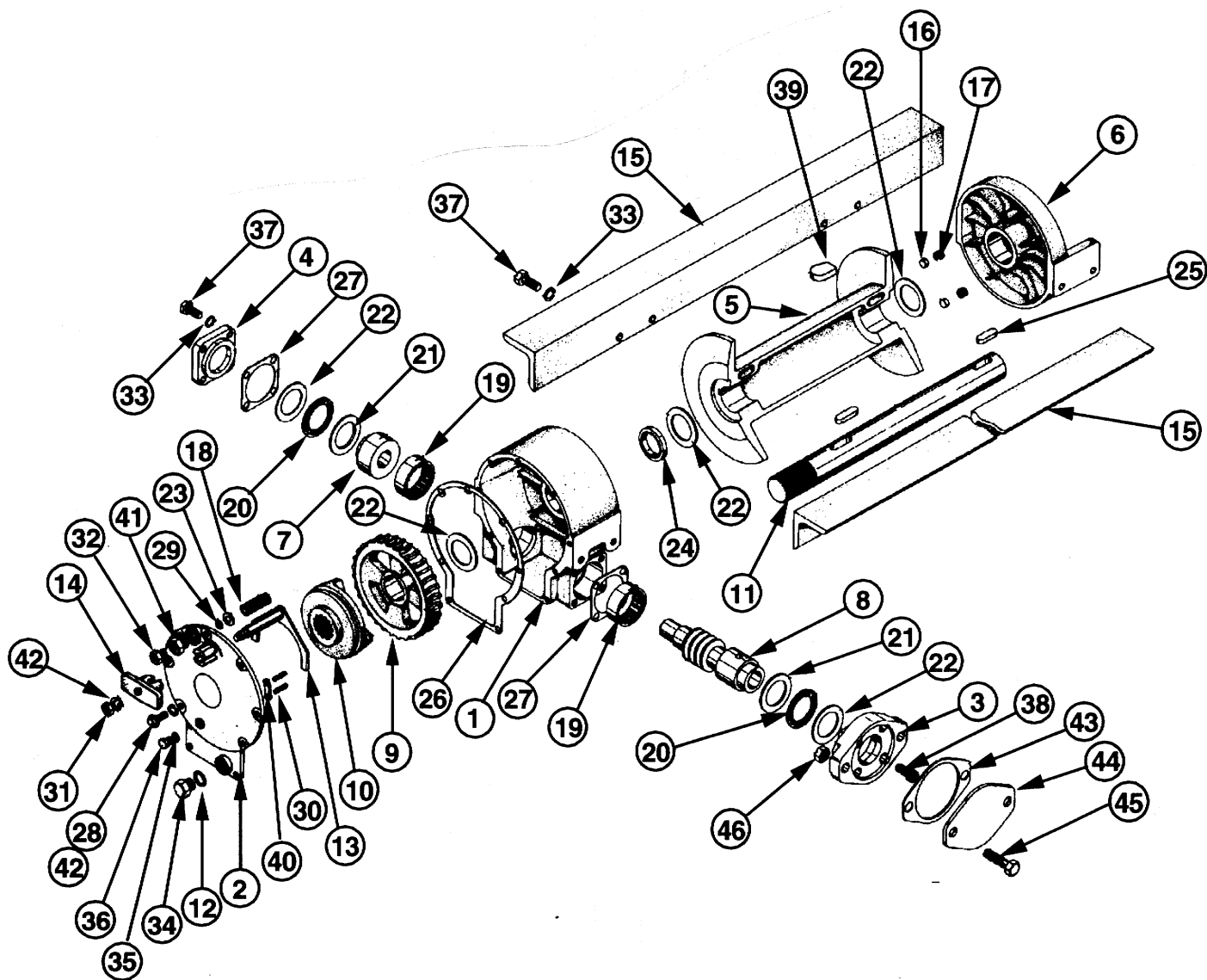
REF	PART NO.	DESCRIPTION	REQ'D
1	219-0915-004	SEAL, lip	1
2	219-1915-001	COVER, shaft end.....	1
3	219-1473-001	CHECK ASSEMBLY	2
4	219-0915-003	SEAL, ring	1
5	219-0915-002	BEARING, roller	4
6	219-0915-007	SEAL, pocket.....	12
7	219-0915-006	PLATE, thrust.....	2
8	219-1683-004	GEARS – matched set.....	1
9	219-0915-008	SEAL, gasket.....	2
10	219-1915-002	HOUSING, gear	1
11	219-1705-010	PIN, dowel	4
12	219-1915-003	COVER, port end	1
13	219-1683-007	WASHER	4
14	219-0915-011	CAPSCREW	4



**HYDRAULIC PUMP – DIRECT MOUNT
219-1916**

REF	PART NO.	DESCRIPTION	REQ'D
1	219-0915-04	SEAL, lip	1
2	219-1915-01	COVER, shaft end	1
3	219-1473-01	CHECK ASSEMBLY	2
4	219-0915-03	SEAL, ring	1
5	219-0915-02	BEARING, roller.....	4
6	219-0915-07	SEAL, pocket	12
7	219-0915-06	PLATE, thrust.....	2
8	219-1916-04	GEARS – matched set	1
9	219-0915-08	SEAL, gasket	2
10	219-1916-02	HOUSING, gear.....	1
11	219-1705-10	PIN, dowel.....	4
12	219-1915-03	COVER, port end.....	1
13	219-1683-07	WASHER	4
14	219-0915-11	CAPSCREW	4

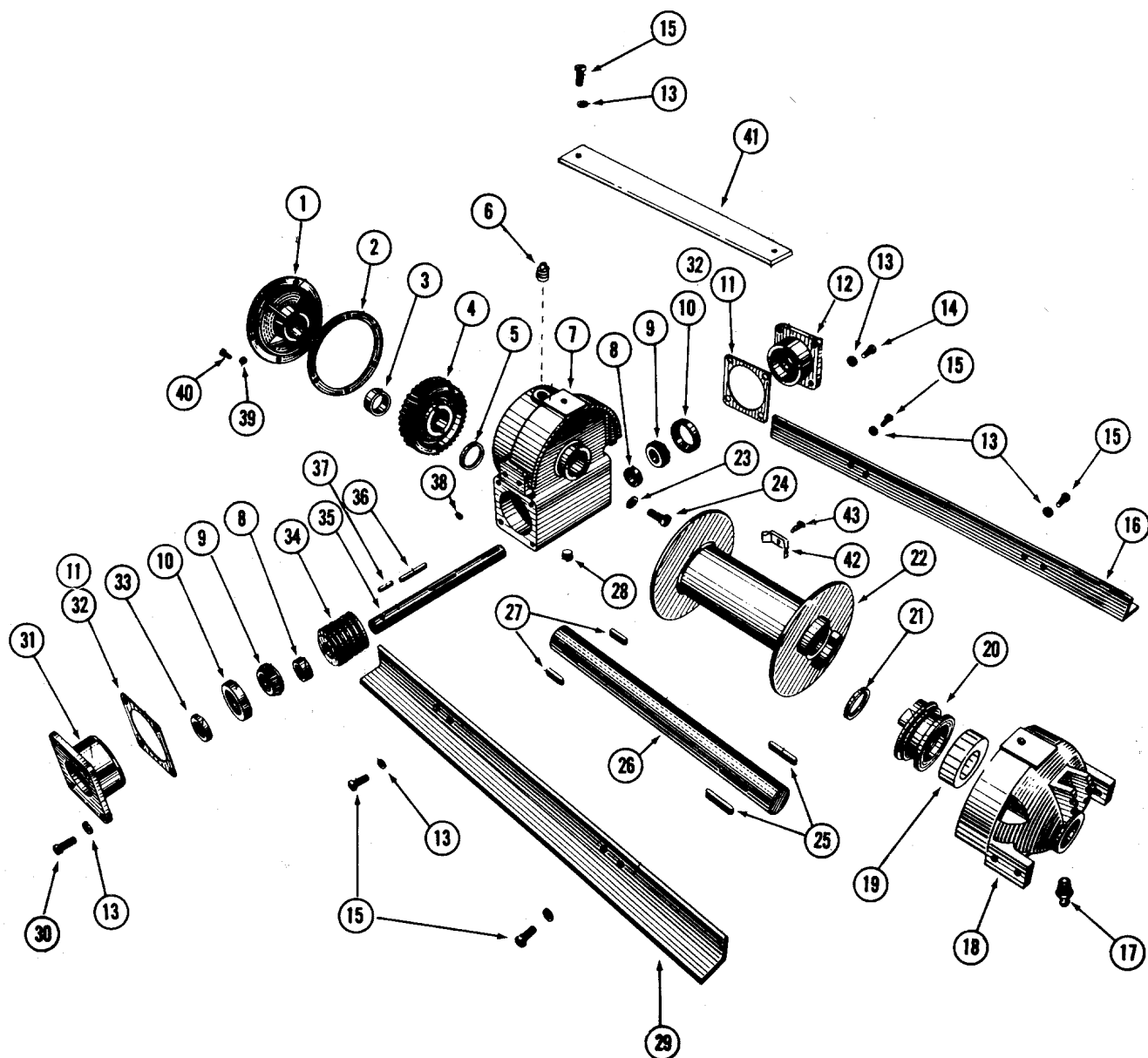
8,000 LB. WINCH ASSEMBLY 253-2291



**8,000 LB. WINCH ASSEMBLY
253-2291**

REF	PART NO.	DESCRIPTION	REQ'D
1	253-2291-047	HOUSING, worm	1
2	253-2291-002	COVER, worm	1
3	253-2291-003	ADAPTER	1
4	253-2291-004	RETAINER, bearing	1
5	253-2291-005	DRUM, cable	1
6	253-2291-006	SHROUD, support	1
7	253-2291-007	ADAPTER, bearing	1
8	253-2291-008	WORM – 34:1	1
9	253-2291-009	GEAR, worm – 34:1	1
10	253-2291-010	CLUTCH	1
11	253-2291-011	SHAFT, cable drum	1
12	253-2291-012	O-RING	1
13	253-2291-013	REDUCER	1
14	253-2291-014	SHIFTER ASSEMBLY	1
15	253-2291-015	HANDLE, clutch	1
16	253-2291-016	ANGLE, base	2
17	253-2291-017	DISC, drag brake	2
18	253-2291-018	SPRING, drag brake	2
19	253-2291-019	SPRING, clutch	1
20	253-2291-020	BEARING, needle	2
21	253-2291-021	BEARING, thrust	2
22	253-2291-022	RACE, thrust – 1/8"	2
23	253-2291-023	RACE, thrust – 1/16"	5
24	253-2291-024	RACE, thrust	1
25	253-2291-025	SEAL, oil	1
26	253-2291-026	KEY	2
27	253-2291-027	GASKET, worm cover	2
28	253-2291-028	GASKET, bearing retainer	4
29	253-2291-029	CAPSCREW – 1/4" – 20NC x 3/4"	9
30	253-2291-030	O-RING	1
31	253-2291-031	PIN, roll	8
32	253-2291-032	NUT, hex – 1/4" – 20NC	1
33	253-2291-033	VENT	1
34	253-2291-034	O-RING	1
35	253-2291-035	PLUG	1
36	253-2291-036	ANCHOR, cable	1
37	253-2291-037	PLATE, friction	4
38	253-2291-038	WASHER, lock	12
39	253-2291-039	PLUG, drain	1
40	253-2291-040	CAPSCREW – 3/8" – 16NC x 1"	12
41	253-2291-041	CAPSCREW – 3/8" – 16NC x 1-1/4"	4
42	253-2291-042	WASHER, lock – 1/4"	10
43	253-2291-043	GASKET	1
44	253-2291-044	SHIELD, dust	1
45	253-2291-045	CAPSCREW – 1/2" – 20NC x 1-3/4" grade 8	2
46	253-2291-046	NUT, jam – 1/2" – 20NC	2
-	253-2291-001	SEAL KIT (consists of items 12, 25, 27, 28, 30, 34, 43)	1

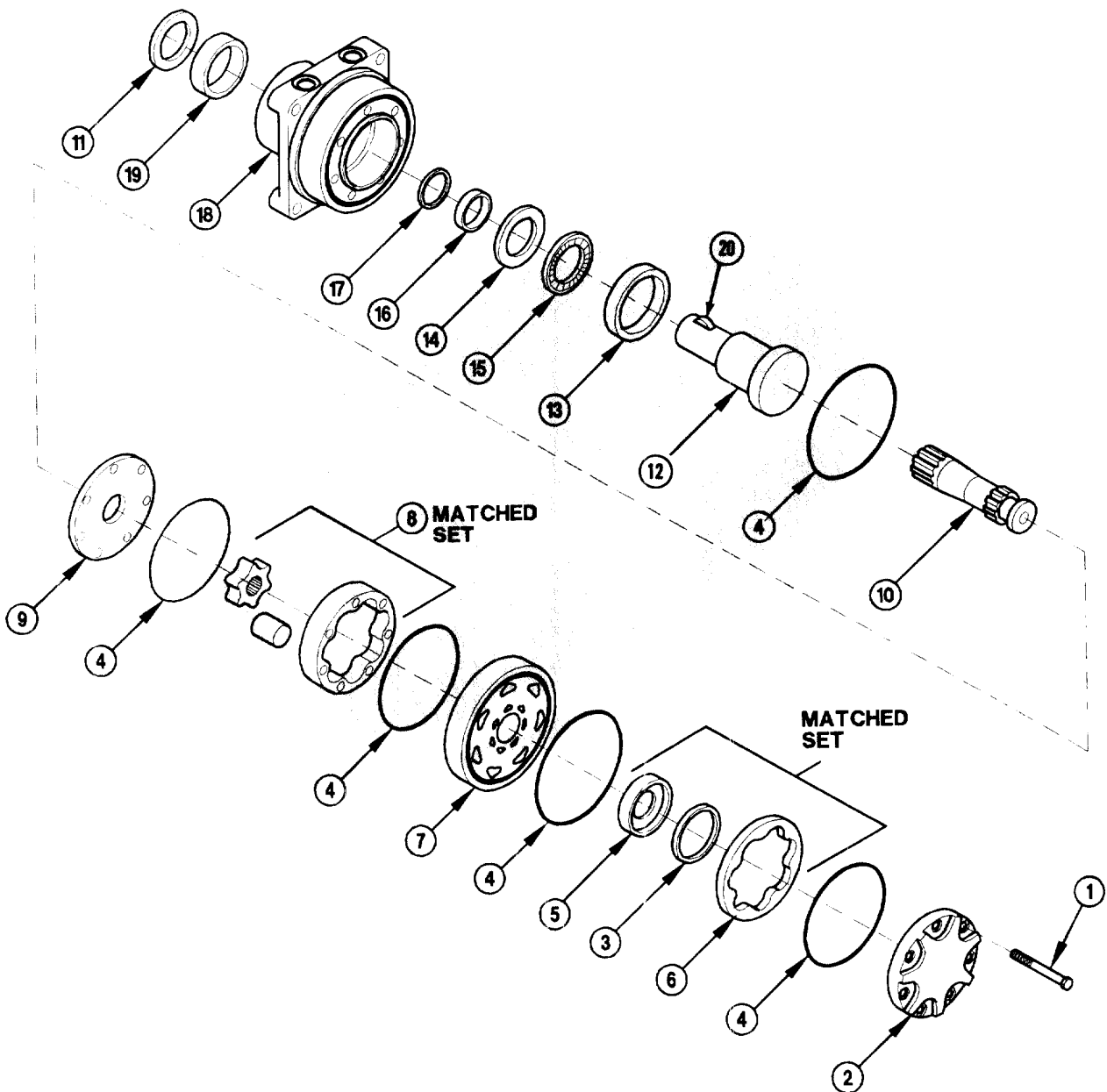
12,000 LB. WINCH ASSEMBLY
253-1472



FORMULA 4000**12,000 LB. WINCH ASSEMBLY
253-1472**

REF	PART NO.	DESCRIPTION	REQ'D
1	253-1472-001	COVER, housing.....	1
2	253-1472-002	GASKET	1
3	253-1472-003	RACE, thrust	1
4	253-1472-004	GEAR, worm	1
5	253-1472-005	RING, thrust	1
6	253-1472-006	PLUG, pipe.....	1
7	253-1472-007	HOUSING, worm	1
8	253-1472-008	SPACER, worm.....	2
9	253-1471-012	CONE, bearing	2
10	253-1471-014	CUP, bearing	2
11	253-1471-015	GASKET	3
12	253-1471-017	CONTAINER, bearing	1
13	253-1471-002	WASHER, lock	18
14	253-1471-049	CAPSCREW	4
15	253-1472-015	CAPSCREW	10
16	253-1472-016	ANGLE, base	1
17	253-1471-028	FITTING, grease	1
18	253-1471-027	LEG, bearing	1
19	253-1472-019	SPACER, clutch	1
20	253-1471-030	CLUTCH	1
21	253-1471-022	RING, retaining.....	1
22	253-1472-022	DRUM, cable	1
23	253-1472-023	WASHER, lock	2
24	253-1472-024	CAPSCREW	2
25	253-1471-013	KEY, clutch	2
26	253-1472-026	SHAFT, cable drum	1
27	253-1472-027	KEY, worm gear	2
28	253-1472-028	PLUG, pipe.....	1
29	253-1472-029	ANGLE, base	1
30	253-1472-030	CAPSCREW	4
31	253-1471-042	CONTAINER, bearing	1
32	253-1471-016	GASKET	3
33	253-1471-044	SEAL, grease	1
34	253-1472-034	WORM	1
35	253-1471-041	SHAFT, worm.....	1
36	253-1471-040	KEY, worm	1
37	253-1471-043	KEY	1
38	253-1472-038	PLUG, pipe.....	1
39	253-1472-039	WASHER, lock	6
40	253-1472-040	CAPSCREW	6
41	253-1472-041	STRAP.....	1
42	253-1472-042	CLAMP, cable	1
43	253-1472-043	SCREW	1

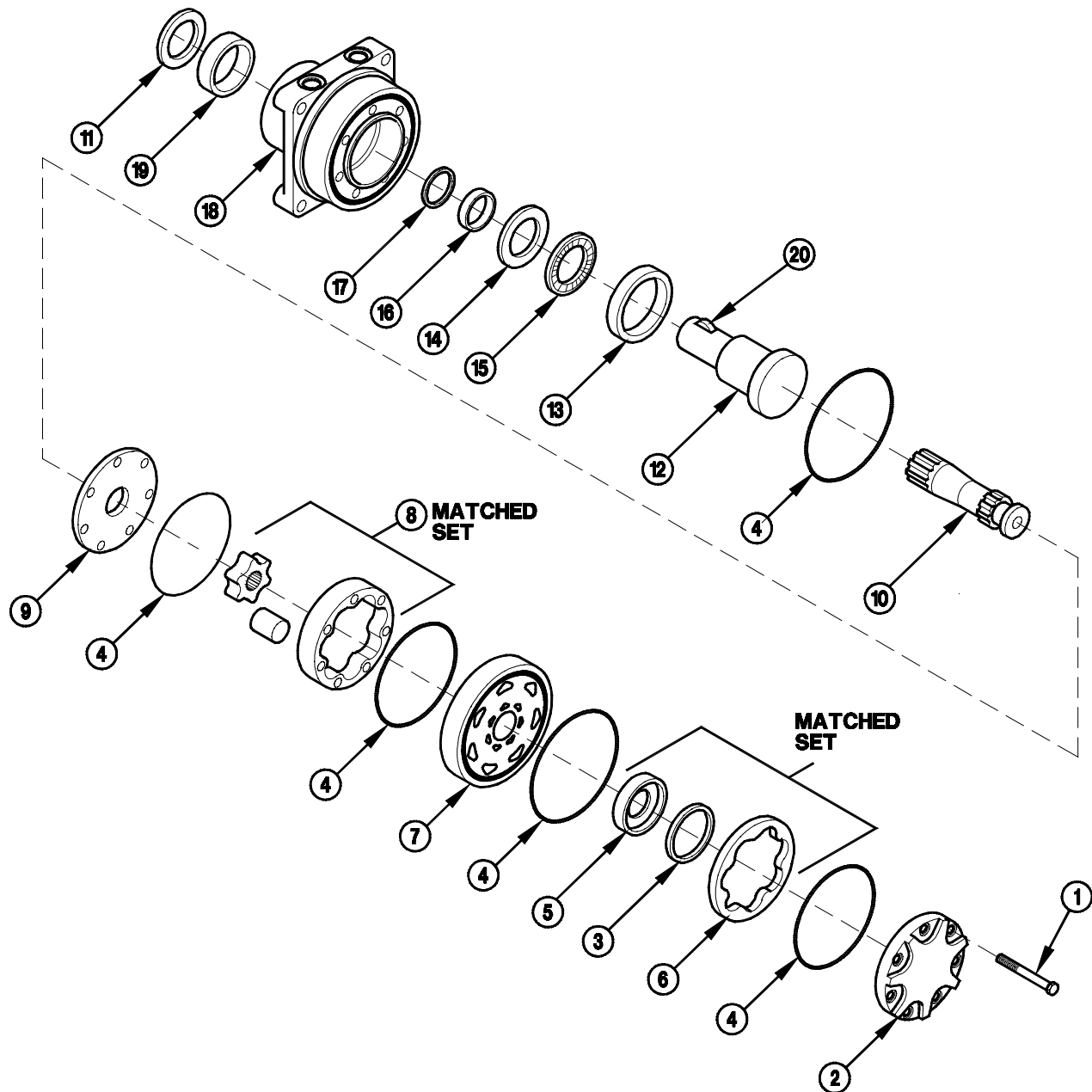
**8,000 LB. WINCH MOTOR
219-1878**



**8,000 LB. WINCH MOTOR
219-1878**

REF	PART NO.	DESCRIPTION	REQ'D
1	219-1878-001	BOLT	5
2	219-1878-002	COVER, end.....	1
3	219-1878-004	SEAL, commutator	1
4	219-1878-005	RING, seal	5
5	219-1878-006	SEAL, inner	1
6	219-1878-003	COMMUTATOR & RING ASSEMBLY (matched set).....	1
7	219-1878-007	MANIFOLD	1
8	219-1878-008	ROTOR SET	1
9	219-1878-009	PLATE, wear	1
10	219-1878-010	LINK, drive	1
11	219-1878-019	SEAL, dirt and water	1
12	219-1878-011	SHAFT, coupling	1
13	219-1878-013	BUSHING, bronze	1
14	219-1878-014	WASHER, thrust	1
15	219-1878-015	BEARING, thrust	1
16	NSS	SEAL, shaft	1
17	219-1878-016	RING, back-up	1
18	219-1878-017	HOUSING (includes items 11 & 13)	1
19	219-1878-018	BEARING ("DU")	1
20	219-1878-012	KEY	1
21	219-1878-020	PACK, grease (not shown)	1
-	219-1878-020	SEAL KIT (consists of items 3, 4, 5, 11, 13, 21).....	1

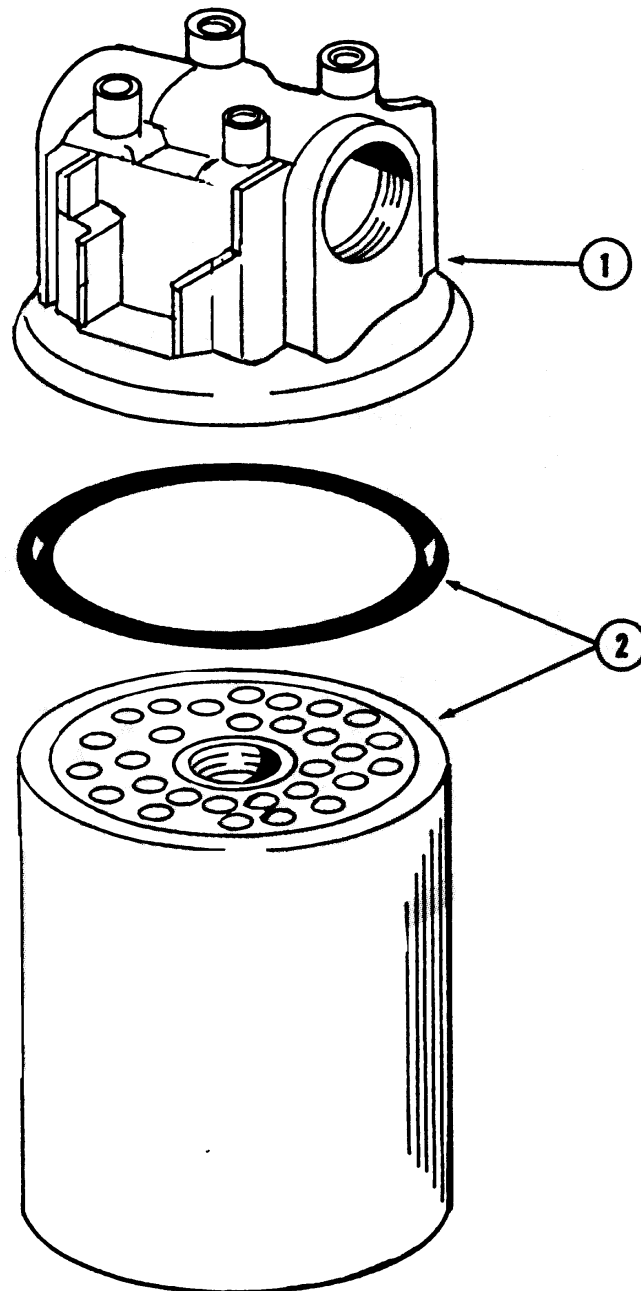
**12,000 LB. WINCH MOTOR
219-1879**



**12,000 LB. WINCH MOTOR
219-1879**

REF	PART NO.	DESCRIPTION	REQ'D
1	219-1879-001	BOLT	5
2	219-1878-002	COVER, end.....	1
3	219-1878-004	SEAL, commutator	1
4	219-1878-005	RING, seal	5
5	219-1878-006	SEAL, inner	1
6	219-1878-003	COMMUTATOR & RING ASSEMBLY (matched set).....	1
7	219-1878-007	MANIFOLD	1
8	219-1879-002	ROTOR SET	1
9	219-1878-009	PLATE, wear	1
10	219-1879-003	LINK, drive	1
11	219-1878-019	SEAL, dirt & water	1
12	219-1878-011	SHAFT, coupling	1
13	219-1878-013	BUSHING, bronze	1
14	219-1878-014	WASHER, thrust	1
15	219-1878-015	BEARING, thrust	1
16	NSS	SEAL, shaft	1
17	219-1878-016	RING, back-up	1
18	219-1878-017	HOUSING – (includes items 11 & 13)	1
19	219-1878-018	BEARING, “DU”	1
20	219-1878-012	KEY	1
21	219-1878-020	PACK, grease – (not shown)	1
-	219-1878-021	SEAL KIT – (consists of items 3, 4, 5, 11, 13, 21).....	1

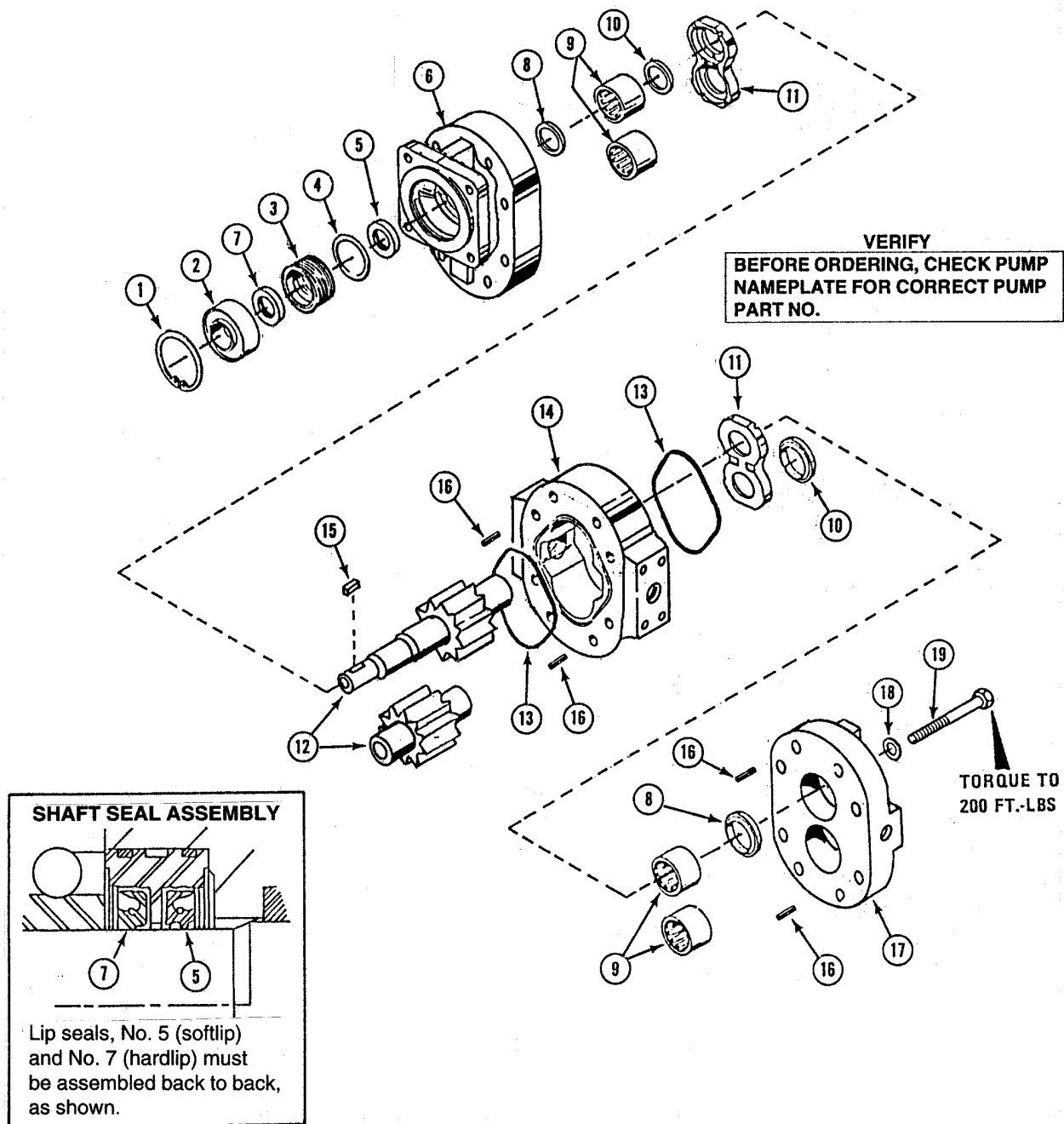
HYDRAULIC OIL FILTER
075-0585



**HYDRAULIC OIL FILTER
075-0585**

REF	PART NO.	DESCRIPTION	REQ'D
1	075-0587	HEAD, oil filter	1
2	075-0425-001	ELEMENT, spin-on oil – (10 micron)	1

FRONT MOUNT PUMP 219-1893

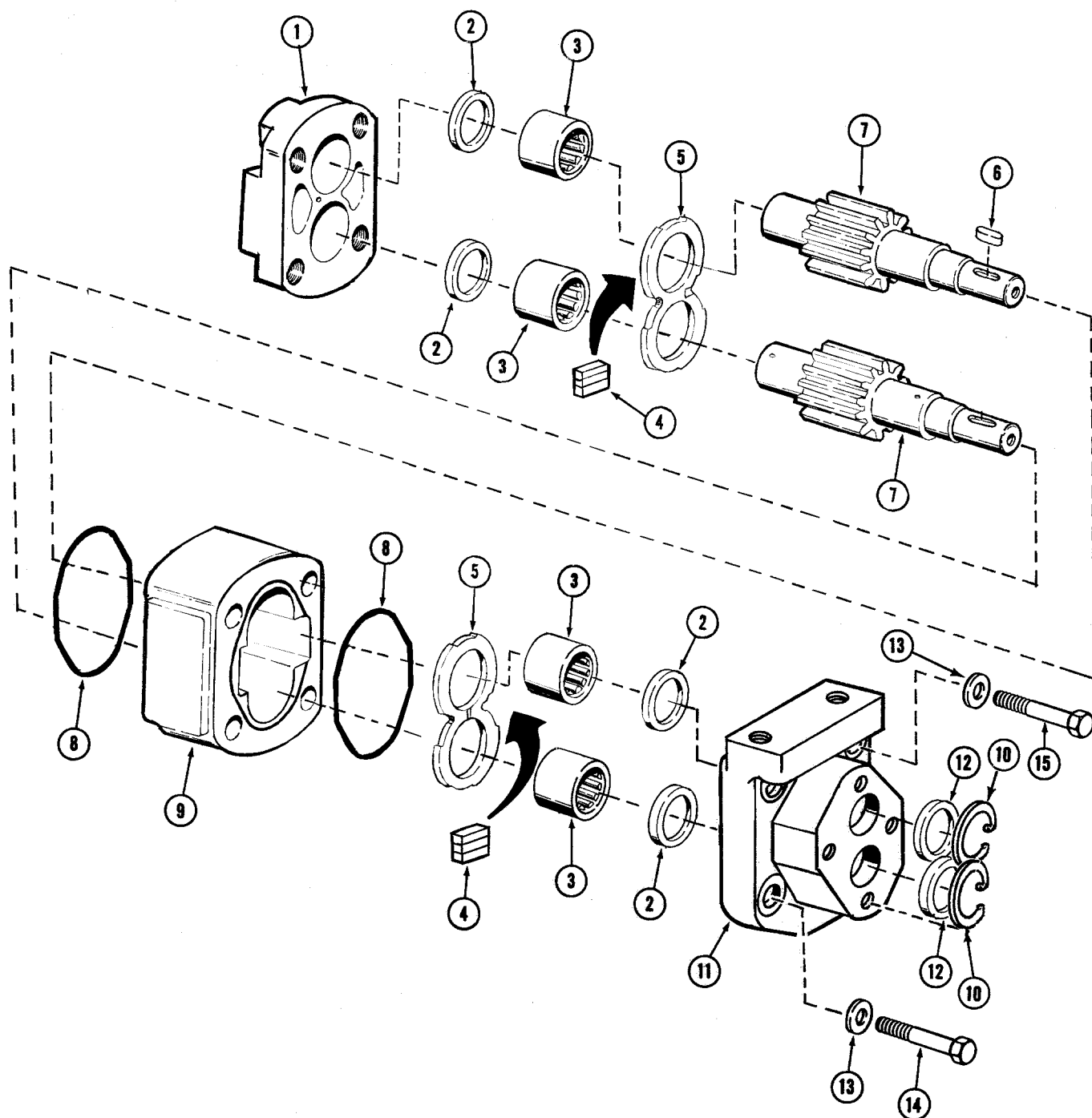


**FRONT MOUNT PUMP
219-1893**

REF	PART NO.	DESCRIPTION	REQ'D
1	219-1473-002	RING, snap.....	1
2	219-1473-008	BEARING, outboard.....	1
3	219-1684-007	RETAINER, seal.....	1
4	219-1473-005	O-RING, retainer.....	1
5	219-1684-008	SEAL, inside shaft.....	1
6	219-1684-001	COVER, front.....	1
7	219-1684-009	SEAL, outside shaft.....	1
8	219-1473-006	SEAL, ring.....	2
9	219-1473-007	BEARING.....	4
10	219-1684-014	SEAL, pressure balance.....	4
11	219-1473-013	PLATE, wear.....	2
12	219-1684-003	GEAR SET.....	1
13	219-1473-011	SEAL, gasket.....	2
14	219-1684-004	BODY – (mach. inlet).....	1
15	219-1473-014	KEY.....	1
16	219-1684-011	PIN, dowel.....	4
17	219-1684-002	COVER, rear.....	1
18	219-1473-021	WASHER, lock.....	8
19	219-1684-013	CAPSCREW.....	8
20	219-1684-010	PLUG.....	2

SEE PAGE 5.66 FOR POWR PRO VALVE.

PTO MOUNT HYDRAULIC PUMP
219-1738 and 219-1748

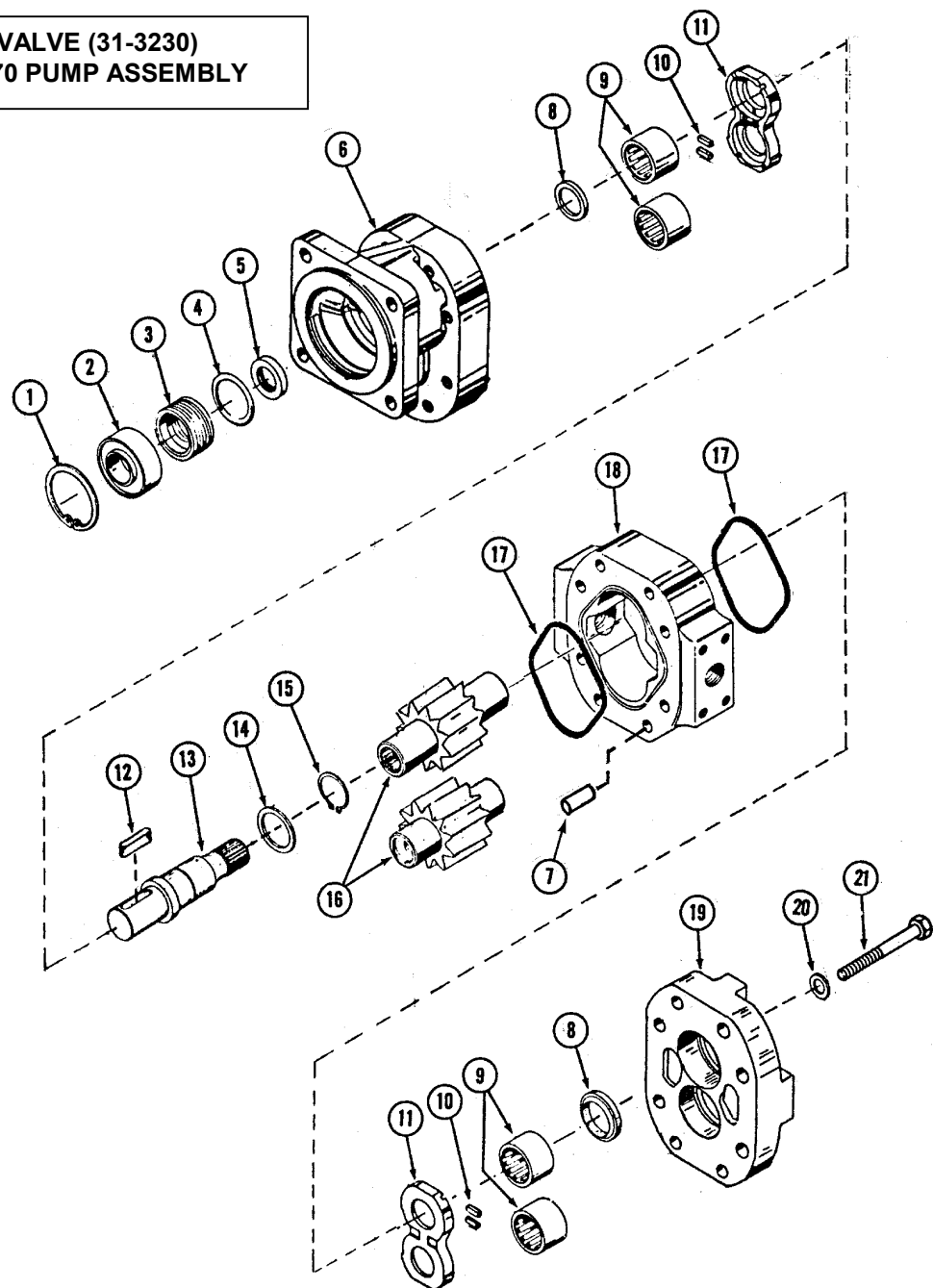


**PTO MOUNT HYDRAULIC PUMP
219-1738 and 219-1748**

REF	PART NO.	DESCRIPTION	REQ'D
1	219-1738-001	COVER, port end	1
2	219-0915-003	SEAL, ring	4
3	219-0915-002	BEARING, roller	4
4	219-1895-011	SEAL, pocket.....	12
5	219-1738-005	PLAE, thrust	2
6	219-1738-003	KEY	1
7	219-1738-004	SHAFT & GEAR – (matched set) for 219-1738 pump	1
	219-1748-002	SHAFT & GEAR – (matched set) for 219-1748 pump	1
8	219-0915-008	SEAL, gasket.....	1
9	219-1738-006	HOUSING, gear – 219-1738 pump	1
	219-1748-003	HOUSING, gear – 219-1748 pump	1
10	219-1738-012	RING, snap.....	2
11	219-1738-008	COVER, shaft end.....	1
12	219-1738-011	SEAL, lip	2
13	219-1473-021	WASHER	4
14	219-1473-020	CAPSCREW – for 219-1738 pump	2
	219-1474-003	CAPSCREW – for 219-1748 pump	2
15	219-1738-002	CAPSCREW – for 219-1738 pump	2
	219-1748-001	CAPSCREW – for 219-1748 pump	2

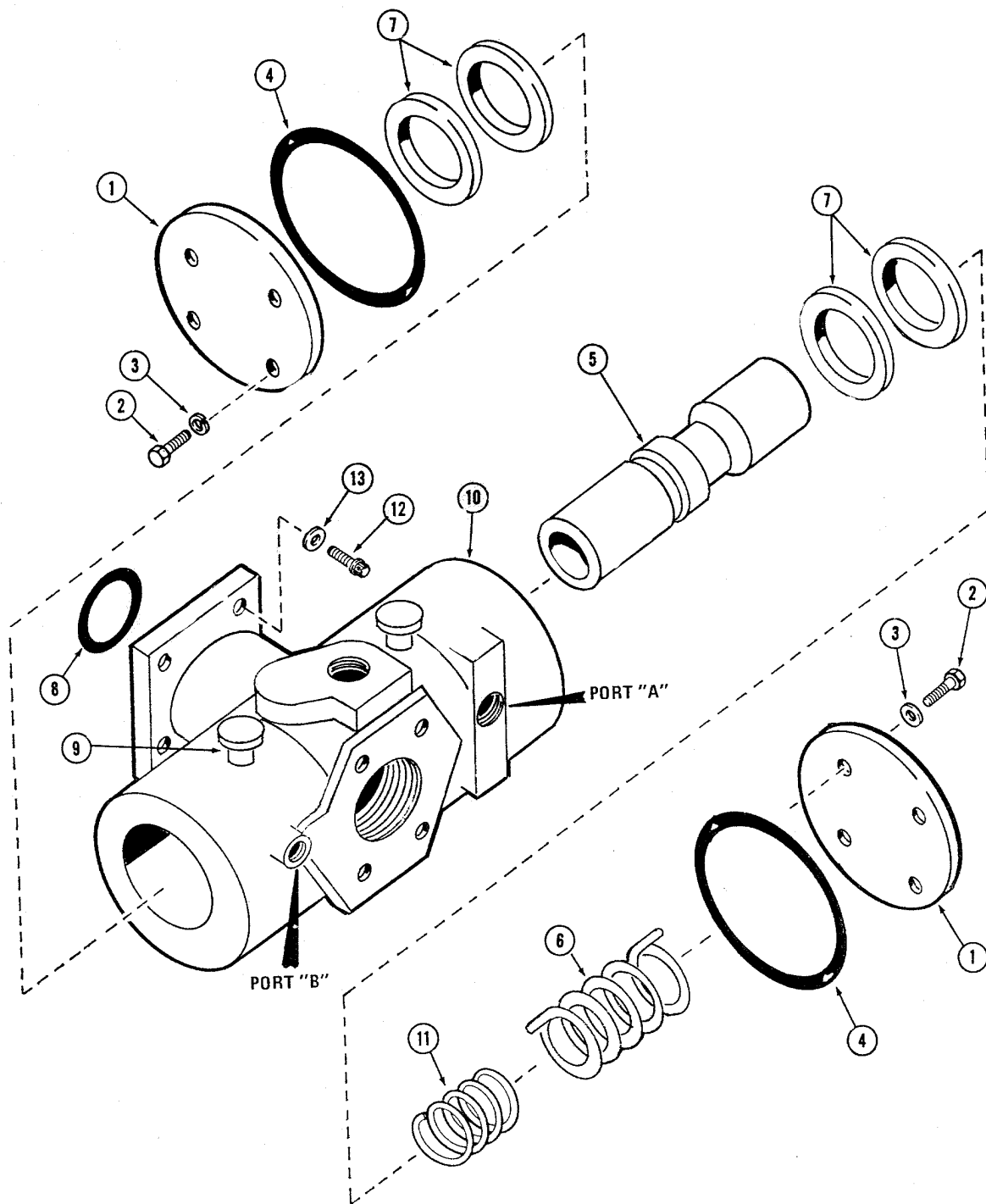
HYDRAULIC PUMP 219-1870-001

PUMP & DRY VALVE (31-3230)
MAKE 219-1870 PUMP ASSEMBLY



**HYDRAULIC PUMP
219-1870-001**

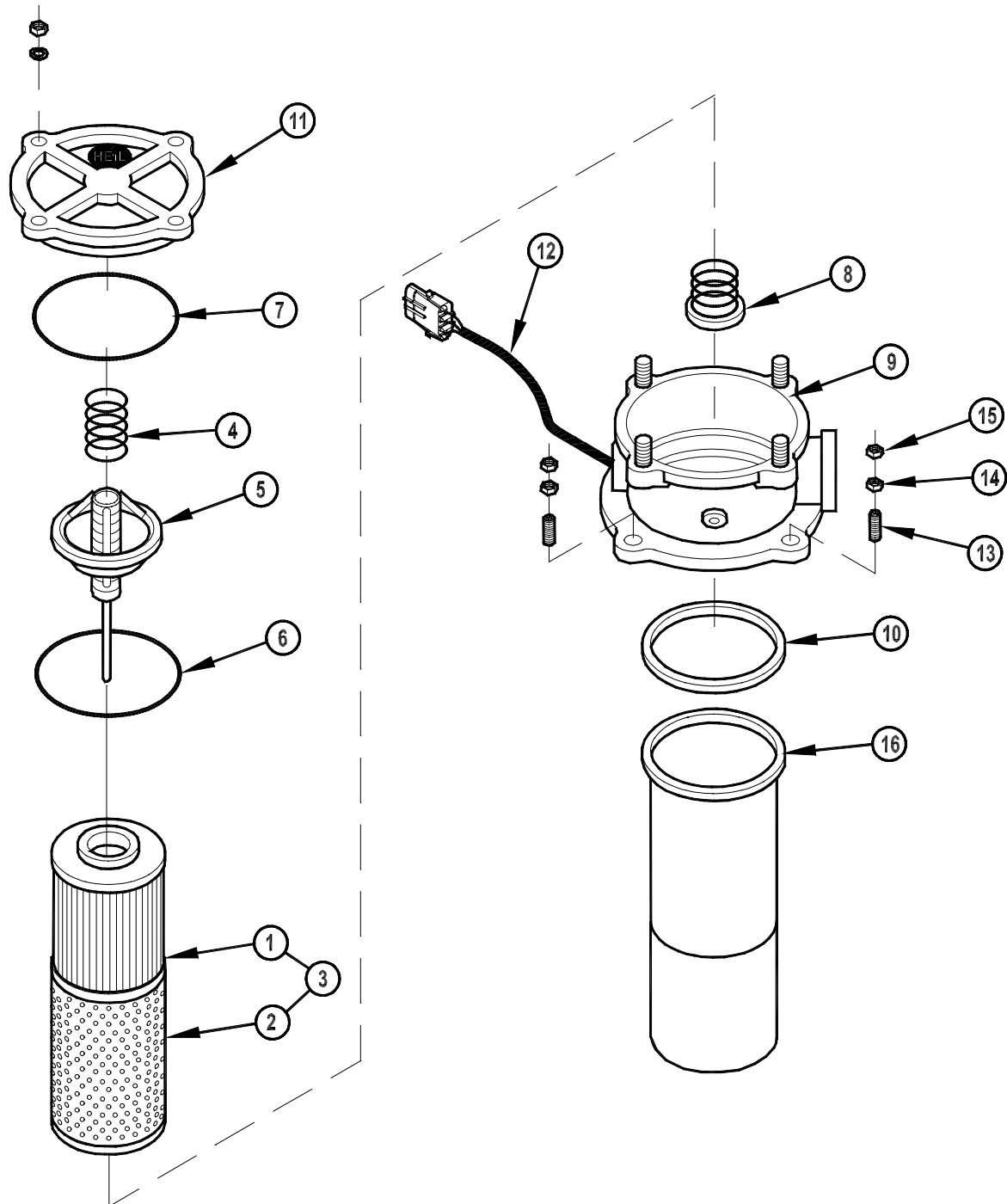
REF	PART NO.	DESCRIPTION	REQ'D
1	219-1473-002	RING, snap.....	1
2	219-1473-008	RING, bearing retainer.....	1
3	219-1473-003	RETAINER, seal.....	1
4	219-1473-005	O-RING.....	1
5	219-1684-008	SEAL.....	1
6	219-1870-002	COVER, shaft end.....	1
7	219-1684-011	PIN, dowel.....	4
8	219-1870-005	SEAL, ring.....	2
9	219-1473-007	BEARING, roller.....	4
10	219-1870-007	SEAL, pocket.....	12
11	219-1870-006	PLATE, thrust.....	2
12	219-1473-014	KEY.....	1
13	219-1473-017	SHAFT.....	1
14	219-1473-015	SPACER.....	1
15	219-1473-016	RING, retaining.....	1
16	219-1870-003	GEARS.....	1
17	219-1473-011	SEAL, gasket.....	2
18	219-1870-004	HOUSING, gear.....	1
19	219-1870-008	COVER, port end.....	1
20	219-1473-021	WASHER.....	8
21	219-1742-004	CAPSCREW.....	8
22	219-1870-009	PLUG.....	1

DRY VALVE
031-3230

**DRY VALVE
031-3230**

REF	PART NO.	DESCRIPTION	REQ'D
1	031-3230-002	PLATE, end	2
2	031-3230-004	BOLT – 5/16" – 18NC x 1-1/4"	8
3	031-3230-005	WASHER, lock – (hi collar) – 5/16"	8
4	031-3230-003	O-RING	2
5	NSS	SPOOL	1
6	031-3230-007	SPRING.....	1
7	031-3230-008	SEAL, o-ring	4
8	031-3230-009	O-RING	1
9	031-3230-010	VENT, air	2
10	NSS	HOUSING.....	1
11	031-3230-011	SPRING.....	1
12	031-3230-012	CAPSCREW	4
13	031-3230-013	WASHER, lock	4

IN-TANK OIL FILTER ASSEMBLY 075-0724



**IN-TANK OIL FILTER ASSEMBLY
075-0724**

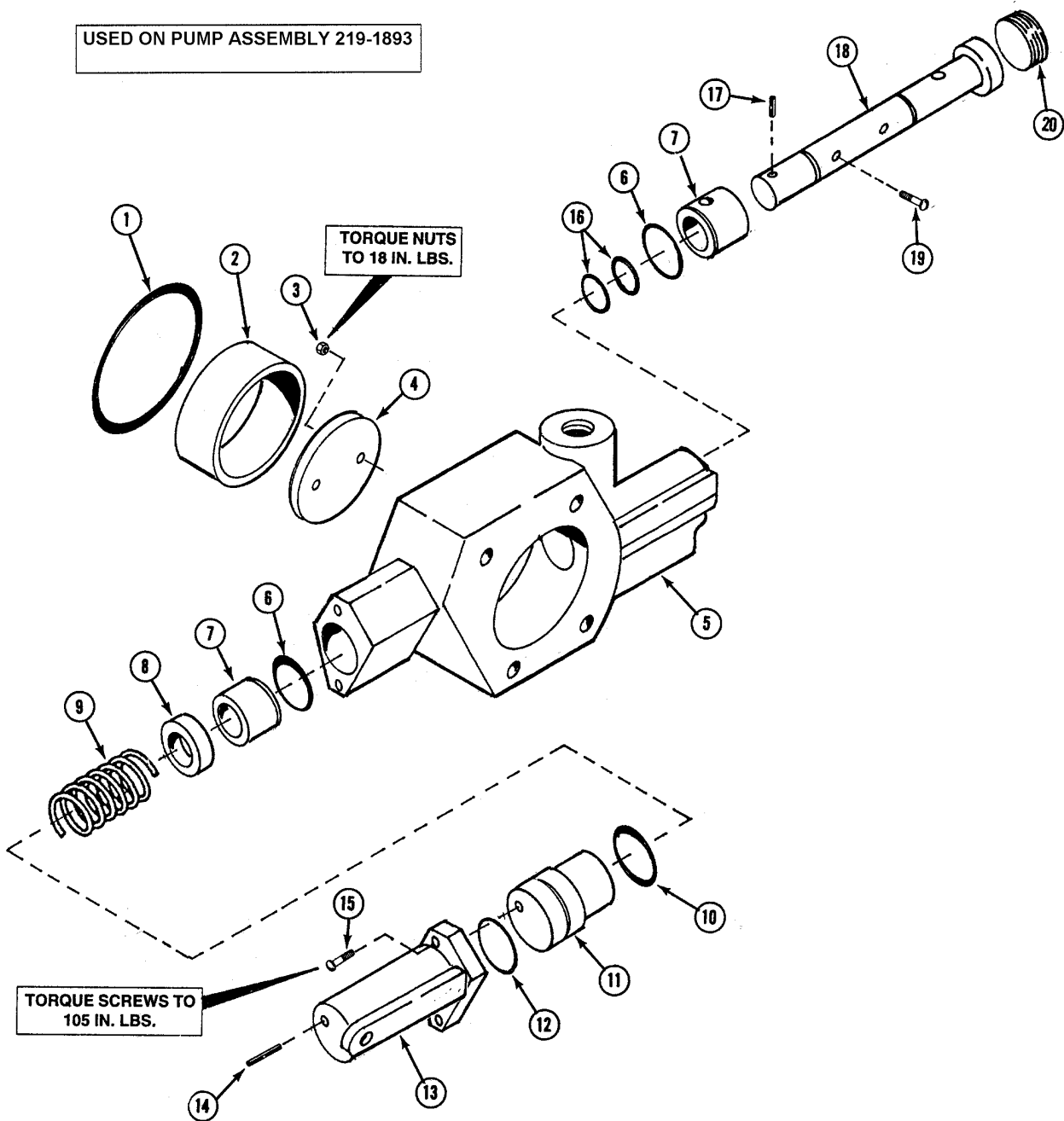
REF	PART NO.	DESCRIPTION	REQ'D
1	075-0724-001	ELEMENT, replacement filter (see note).....	1
2	075-0724-002	SLEEVE.....	1
3	075-0724-003	ELEMENT ASSEMBLY (consists of items 1 & 2)	1
4	075-0711-004	SPRING.....	1
5	075-0711-005	INSERT ASSEMBLY	1
6	075-0711-006	O-RING	1
7	075-0711-003	O-RING, cover	1
8	075-0711-008	BYPASS ASSEMBLY	1
9	075-0711-009	HEAD.....	1
10	075-0711-010	GASKET, tank.....	1
11	075-0724-004	COVER.....	1
12	075-0711-012	INDICATOR, electrical	1
13	047-2293-001	STUD – 3/8" double end	4
14	FS240900	NUT, lock – 3/8" – 24NF	4
15	FS270900	NUT, hex – 3/8" 24NF	4
16	075-0711-011	DIFFUSOR.....	1

NOTE:

75-0711-01 ELEMENT WILL NOT WORK IN 75-0724 FILTER AS IT WILL CAUSE HYDRAULIC SYSTEM DAMAGE.

YOU MAY USE A 75-0724-01 FILTER ELEMENT IN A 75-0711 FILTER HOUSING BY ORDERING (1) 75-0724-03 ASSEMBLY, WHICH INCLUDES AN ELEMENT (75-0724-01) AND A SLEEVE (75-0724-02). AFTER INSTALLING 75-0724-03 ACCORDING TO THE INSTRUCTIONS WITH THE ASSEMBLY, THE ELEMENT (75-0724-01) CAN BE USED FOR FUTURE FILTER CHANGES IN THE 75-0711 HOUSING.

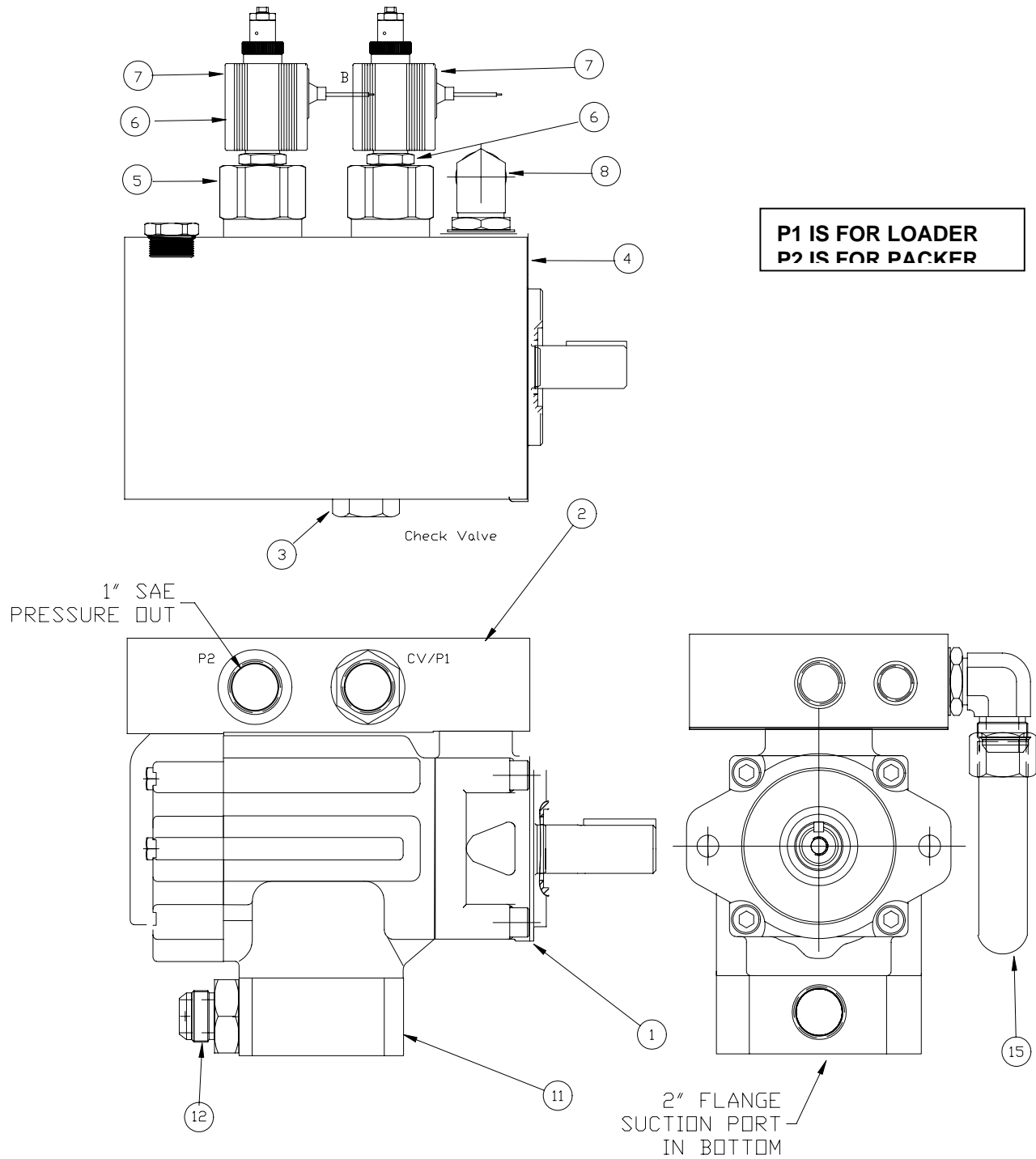
POWR-PRO VALVE for 219-1893 PUMP
031-5736-050



**POWR-PRO VALVE for 219-1893 PUMP
031-5736-050**

REF	PART NO.	DESCRIPTION	REQ'D
1	031-5736-019	O-RING, flange	1
2	031-5736-018	RACE.....	1
3	031-5736-017	LOCKNUT	2
4	031-5736-020	PLATE, throttle	1
5	031-5736-001	BODY, valve.....	1
6	031-5736-015	O-RING, insert.....	2
7	031-5736-004	BUSHING, insert.....	2
8	031-5736-005	COLLAR, locking.....	1
9	031-5736-007	SPRING.....	1
10	031-5736-009	O-RING, piston.....	1
11	031-5736-010	PISTON	1
12	031-5736-013	O-RING, air cup	1
13	031-5736-008	CUP, air	1
14	031-5736-011	PIN, dowel – (long).....	1
15	031-5736-012	SCREW, air cup	2
16	031-5736-014	O-RING, spool.....	2
17	031-5736-006	PIN, dowel – (short).....	1
18	031-5736-003	SPOOL	1
19	031-5736-016	SCREW	2
20	031-5736-002	PLUG.....	1
-	031-5736-021	KIT, seal – (consists of items 1, 10, 6, 12, 16).....	A/R

TANDEM VANE PUMP ASSEMBLY (Operate-In-Neutral)
FRONT MOUNT – 219-2272
PTO MOUNT – 219-2273

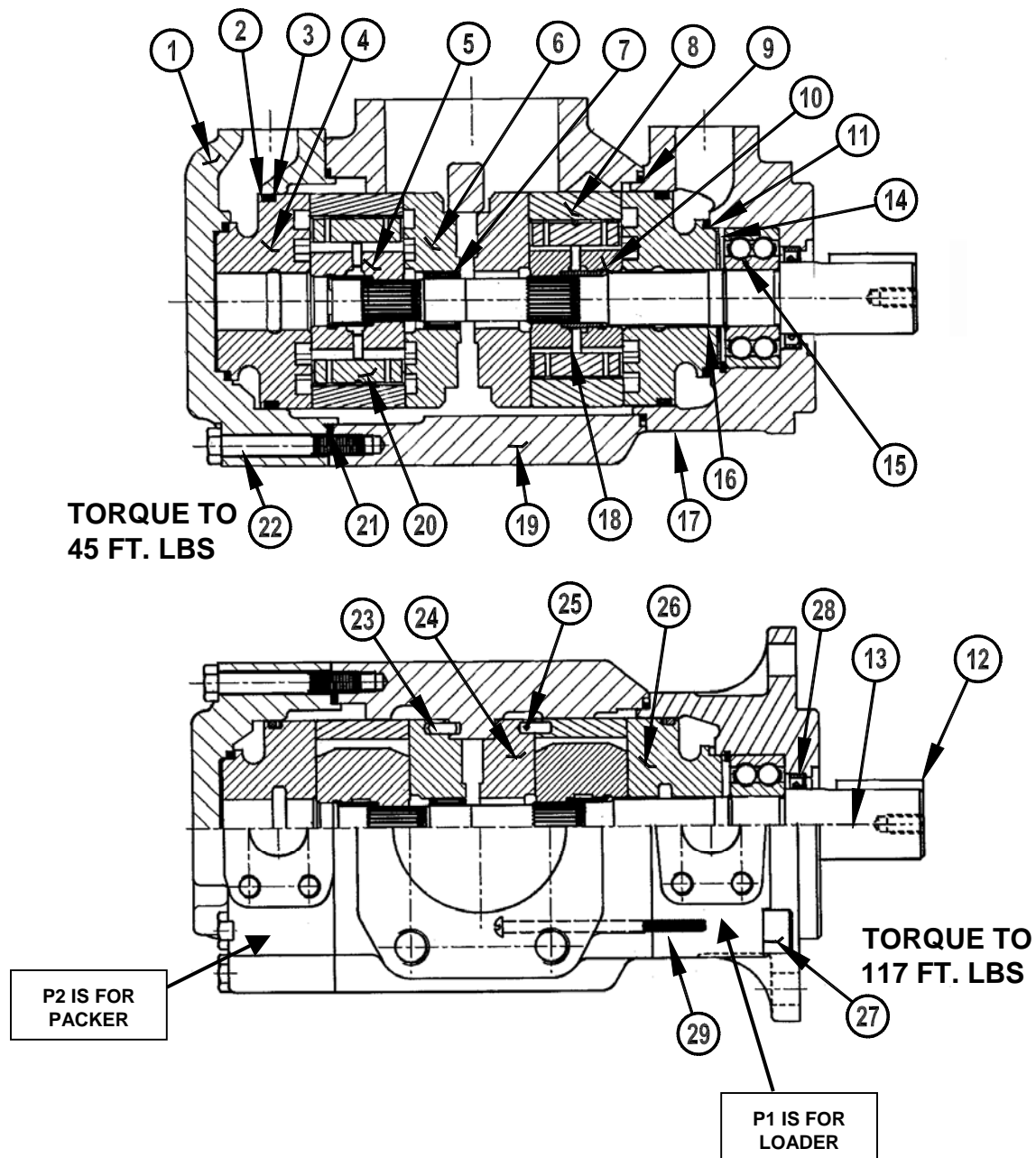


FORMULA 4000

TANDEM VANE PUMP ASSEMBLY (Operate-In-Neutral)
FRONT MOUNT – 219-2272
PTO MOUNT – 219-2273

REF	PART NO.	DESCRIPTION	REQ'D
1	219-2272-001	PUMP, hydraulic – Front Mount (see page 5.71)	1
	219-2273-001	PUMP, hydraulic – PTO mount (see page 5.71)	1
2	031-6375	BLOCK, combined flow	1
3	031-6375-001	VALVE, check	1
4	031-6375-002	BLOCK	1
5	031-6375-003	VALVE, logic (2 way)	2
6	031-6375-004	VALVE, solenoid - N.O.	2
7	031-6375-005	COIL – 12v – with leads	2
8	031-6375-006	ELBOW, 90°	1
9	031-6375-007	O-RING (block to pump)	1
10	031-2256-010	CAPSCREW – 3/8" – 16NC x 2-1/2"	8
	031-2256-011	WASHER, lock – 3/8"	8
11	031-6376	BLOCK, inlet	1
12	031-6376-001	ADAPTER	1
13	031-6375-007	O-RING (block to pump)	1
14	031-2256-010	CAPSCREW – 3/8" – 16NC x 2-1/2"	4
	031-2256-011	WASHER, lock – 3/8"	4
15	219-2288-001	TUBE, bypass	1

TANDEM VANE HYDRAULIC PUMP ONLY (Keyed Shaft)
219-2272-001 - FRONT MOUNT - (LH rotation)
219-2273-001 - PTO MOUNT - (RH Rotation)



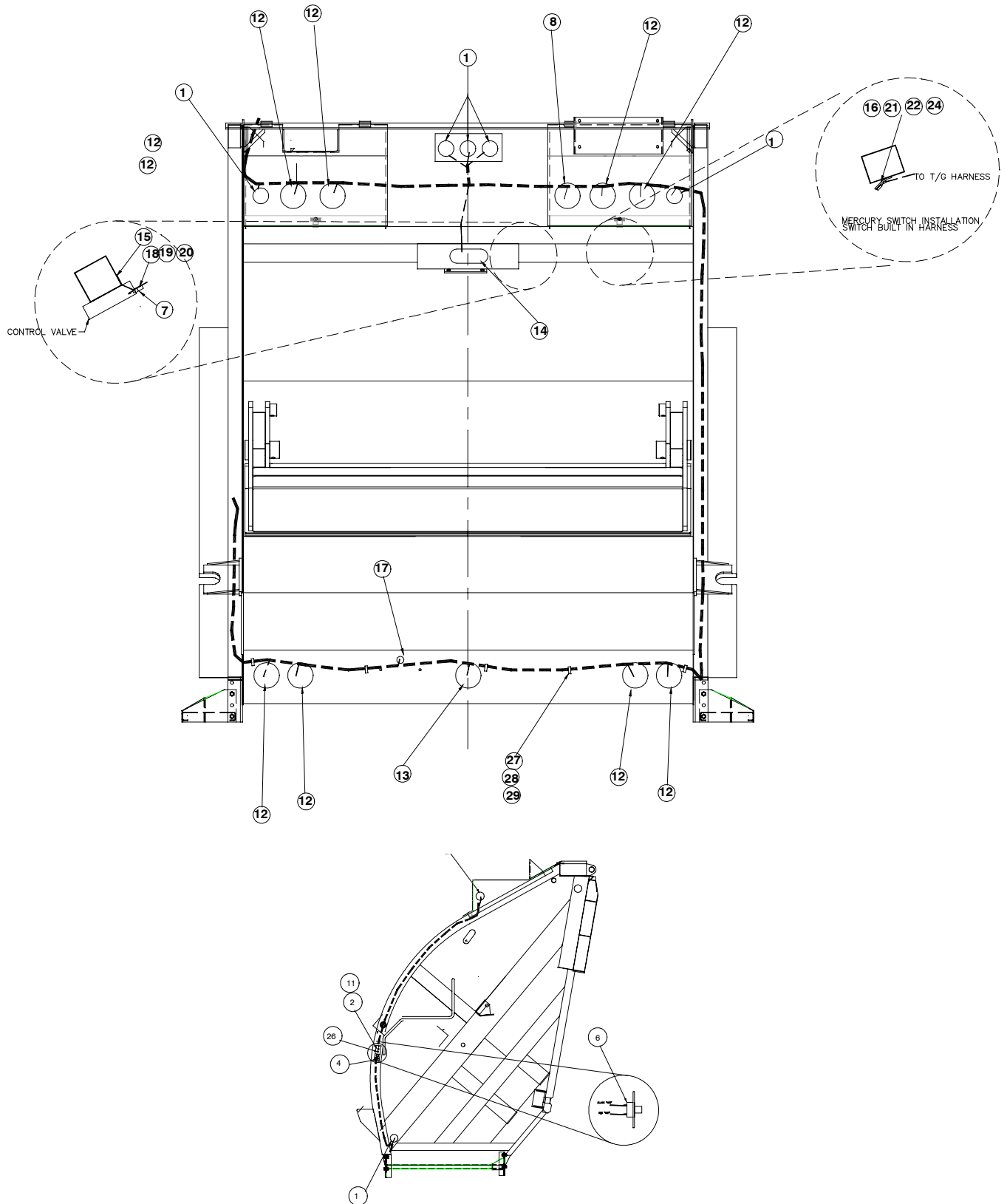
TANDEM VANE HYDRAULIC PUMP ONLY (Keyed Shaft)
219-2272-001 - FRONT MOUNT - (LH rotation)
219-2273-001 – PTO MOUNT – (RH Rotation)

REF	PART NO.	DESCRIPTION	REQ'D
1	219-2076-025	CAP, end.....	1
2	219-2076-026	SEAL, section square	2
3	219-2076-027	RING, back-up	2
4	219-2076-028	PLATE, pressure port	1
5	219-2076-029	ROTOR INSERT ASSEMBLY	1
6	219-2076-030	PLATE, rear port.....	1
7	219-2076-031	BEARING, needle.....	1
8	219-2273-032	RING, cam - for 31 GPM – front P1 pump – RH rotation	1
	219-2272-032	RING, cam - for 31 GPM – front P1 pump – LH rotation.....	1
	219-2273-070	RING, cam - for 22 GPM - rear P2 pump – RH rotation.....	1
	219-2272-070	RING, cam - for 22 GPM – rear P2 pump – LH rotation	1
9	219-2076-033	O-RING	1
10	219-2076-034	ROTOR INSERT ASSEMBLY	1
11	219-2076-035	SEAL, section square	2
12	219-2076-036	KEY	1
13	219-2076-037	SHAFT (keyed)	1
14	219-2076-038	RING, retaining	1
15	219-2076-039	BEARING, ball	1
16	219-2076-040	RING, round section	1
17	219-2076-041	CAP, mounting.....	1
18	219-2076-042	PIN, vane holdout	20
19	219-2076-043	HOUSING	1
20	219-2076-044	VANE	20
21	219-2076-045	SEAL, section square	1
22	219-2076-046	SCREW.....	7
23	219-2076-047	PIN, dowel.....	2
24	219-2076-048	PLATE, pressure port	1
25	219-2076-049	PIN, dowel.....	4
26	219-2076-050	PLATE, rear port.....	1
27	219-2076-051	SCREW.....	4
28	219-2076-052	SEAL, shaft	1
29	219-2076-053	SCREW.....	4
-	219-2076-054	REPAIR KIT (cartridge and plate assembly) (for 219-2272 pump)	1
-	219-2256-100	REPAIR KIT (cartridge and plate assembly) (for 219-2273 pump)	1
-	219-2076-055	SEAL KIT	1
-	219-2076-056	SHAFT & BEARING KIT	1
-	219-2076-057	REAR PORT PLATE & BUSHING.....	1

SECTION 6 – ELECTRICAL

Tailgate Wiring, Lights and Parts.....	6.3
Body Wiring, Lights and Parts.....	6.5
Cab Electrical	6.7
Packard Connector Kit (108-4827)	6.9
Deutsch Connection Kit (108-6461)	6.11
Deutsch Plugs, Pins and Accessories.....	6.13
Micro Relay Kit (069-0032)	6.15

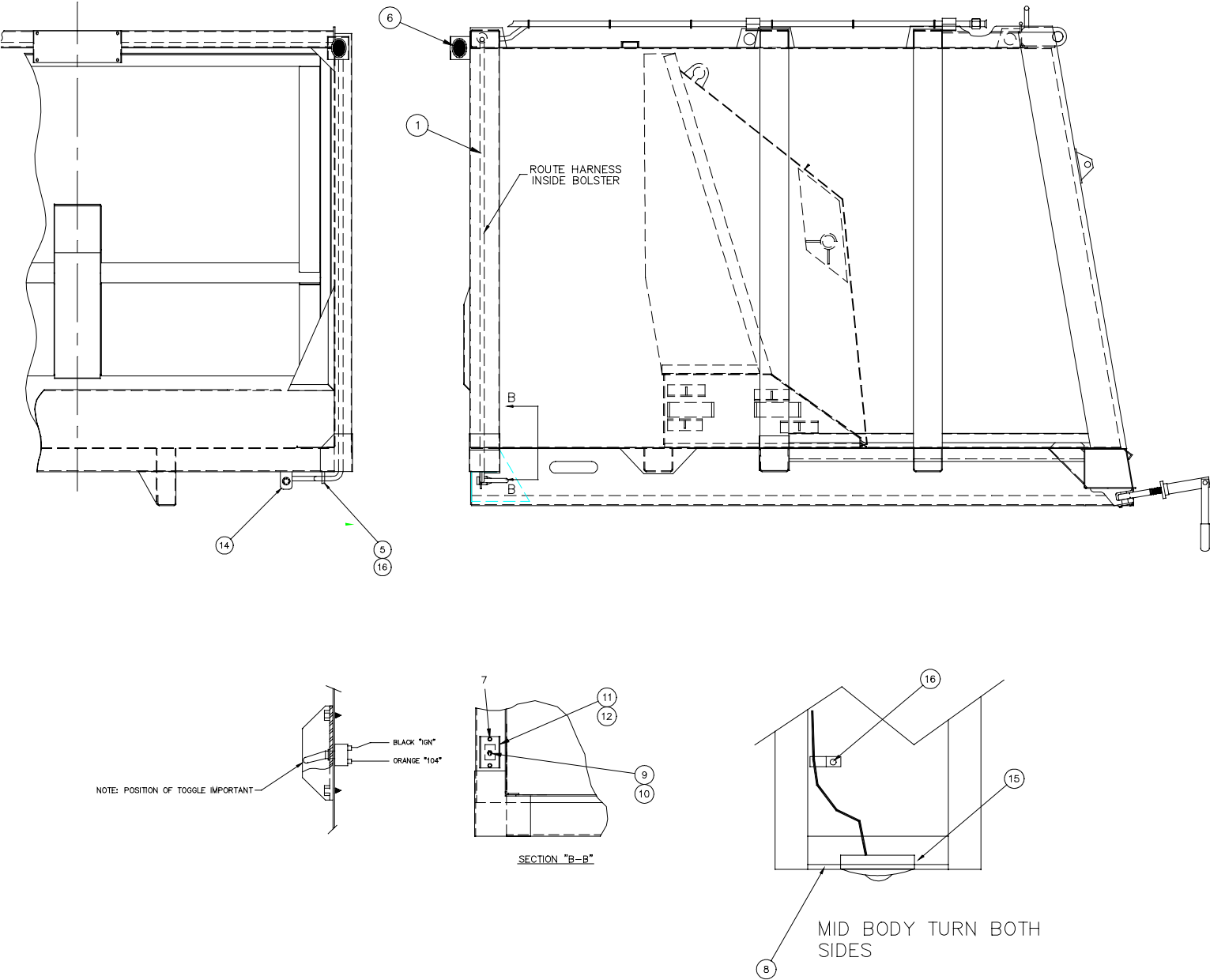
TAILGATE WIRING AND PARTS



FORMULA 4000**TAILGATE WIRING AND PARTS**

REF	PART NO.	DESCRIPTION	REQ'D
1	115-0760	LIGHT, clearance – red.....	9
	115-0760-001	LIGHT.....	1
	115-0760-002	MOUNT, rubber.....	1
	115-0760-003	PIGTAIL.....	1
2	022-3079	GASKET.....	1
3	036-1115	TIE, plastic.....	15
4	047-2151-011	SCREW, tek.....	2
5	108-0472	GROMMET.....	2
6	108-1113	SWITCH, buzzer.....	1
7	108-4870-0PC	SWITCH, limit.....	1
	108-4870	SWITCH.....	1
	108-4914	HARNESS.....	1
8	108-7726	ALARM, back-up.....	1
	108-7726-001	ALARM – 4".....	1
	108-0742-002	GROMMET, mount.....	1
9	263-1046	HARNESS, tailgate wire.....	1
	108-2864	SWITCH, mercury.....	1
11	112-8312	COVER.....	1
12	115-0742	LIGHT, directional/stop – (includes seal).....	8
13	115-0743	LIGHT, back-up (includes seal).....	1
14	115-0869	LIGHT, center brake.....	1
15	211-4312	BRACKET, limit switch.....	1
16	211-4242	BRACKET, alarm.....	1
17	115-0608	LIGHT, license.....	1
	108-4827-013	SEAL, cable.....	1
	108-4827-011	TERMINAL, male.....	1
	115-0608-001	LIGHT.....	1
	108-4827-001	CONNECTOR, 1-way male.....	1
18	FS240400	NUT, lock - #10- 32NF.....	4
19	FS280300	NUT, hex - #8-32NF.....	4
20	FS420313	SCREW - #8 – 32NF x 5/8".....	4
21	FS420421	SCREW - #10 – 32NF x 1".....	2
22	FS420413	SCREW - #10 – 32NF x 5/8".....	3
23	FS510200	WASHER, flat - #6.....	2
24	FS520400	WASHER, flat - #10.....	5
25	FS550300	WASHER, lock - #8.....	1
26	025-0473-003	PLUG – 1/2".....	2
27	036-1122-008	CLAMP.....	5
28	FS070920	CAPSCREW – 3/8" – 16.....	5
29	FS230900	NUT, lock – 3/8" – 16NC.....	5

BODY WIRING and PARTS



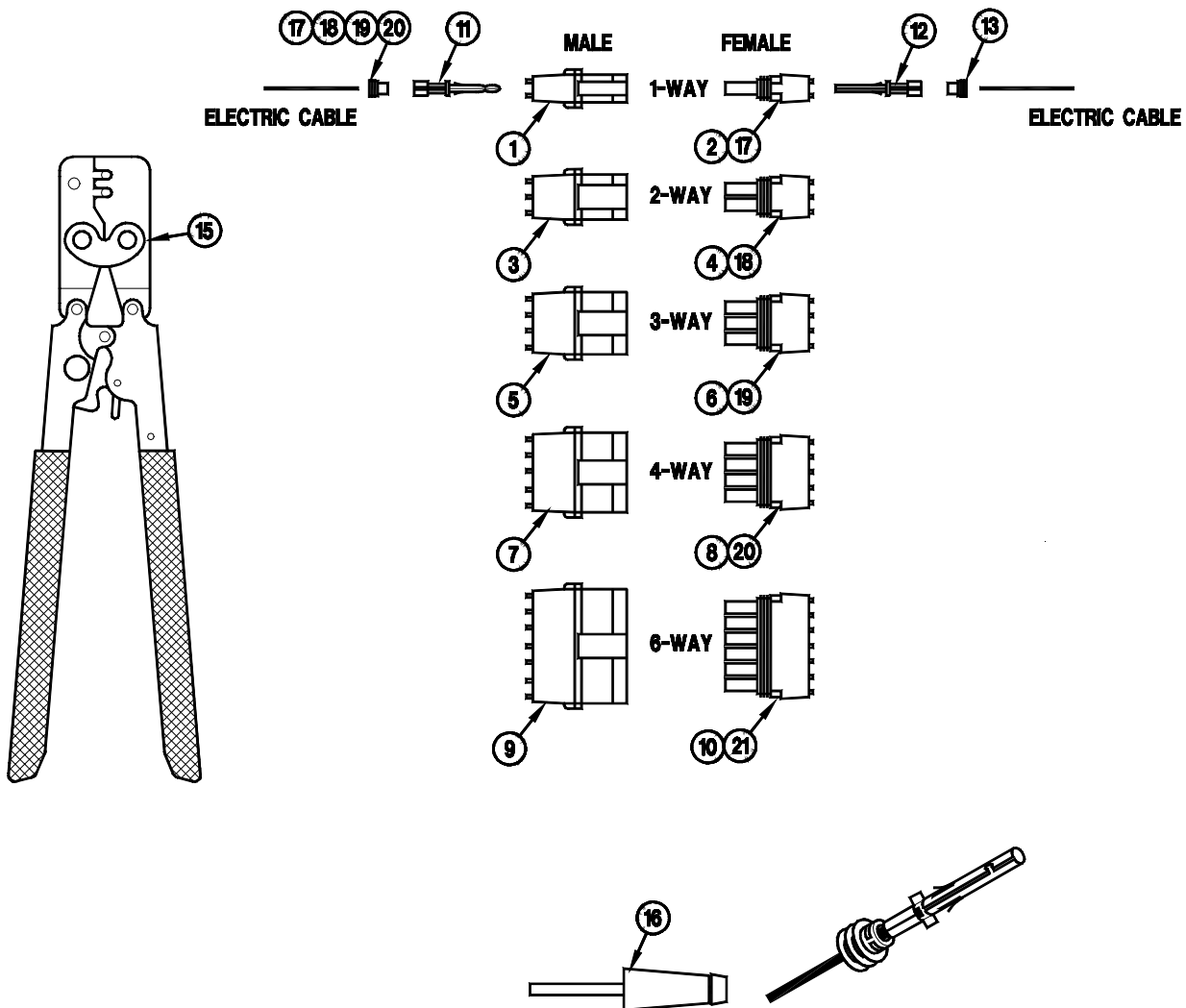
FORMULA 4000**BODY WIRING and PARTS**

REF	PART NO.	DESCRIPTION	REQ'D
1	263-1045-018	HARNESS, body wire (13, 16, 18 yd units)	1
	263-1045-020	HARNESS, body wire (20 yd units)	1
	263-1045-025	HARNESS, body wire (25 yd units)	1
	263-1045-025HD	HARNESS, body wire (25HD units)	1
	263-1045-030	HARNESS, body wire (30 yd units)	1
2	036-1115	CLAMP	A/R
3	FS070936	CAPSCREW – 3/8" – 16NC x 2-3/4"	3
4	FS510900	WASHER, flat – 3/8"	3
5	FS230900	NUT, lock – 3/8" – 16NC	6
6	115-0761	LIGHT, clearance – amber	2
	115-0761-001	LIGHT	1
	115-0761-002	MOUNT, rubber	1
	115-0761-003	PIGTAIL	1
7	047-2151-001	SCREW, tek - #12 x 3/4"	1
8	211-5263	BRACKET, mid-body turn signal	2
9	108-2279	SWITCH, toggle	1
10	108-2280	BOOT	1
11	022-3108	GASKET	1
12	112-6163	COVER	1
13	REF.	DECAL, throttle	1
14	311-3158	BRACKET, harness	1
15	115-0782	LIGHT, mid-body turn signal	2
16	FS070920	CAPSCREW – 3/8" – 16NC x 1"	3

FORMULA 4000**CAB ELECTRICAL
372-1523**

REF	PART NO.	DESCRIPTION	REQ'D
1	115-0766	LIGHT, caution – red	1
	115-0766-001	BASE	1
	115-0766-002	BULB	1
	115-0766-003	LENS	1
2	115-0886	LIGHT, caution – green	1
	115-0766-001	BASE	1
	115-0766-002	BULB	1
	115-0886-003	LENS	1
3	108-4827-112	TERMINAL, male	6
4	108-6752	RELAY	1
5	108-0147	BUZZER	1
6	108-0880	SPADE – 1/4"	2
7	108-1814	SWITCH, toggle	2
8	108-2050	TERMINAL, quick connect	6
9	108-7790	HOLDER, fuse	4
10	108-7112-025	FUSE – 25 amp	4
11	108-3647	CONNECTOR, closed end	2
12	108-4476	LOOM	12 ft.
13	108-4867-005	BREAKER, circuit – 10 amp	1
15	108-4943-003	RING, terminal - #10	6
16	108-5717-002	CONNECTOR, butt – 14-16 AWG	8
17	212-2410	DECAL	1
18	263-0075	HARNESS, light wire	1
19	263-1044	HARNESS, cab to body wire	1
20	108-7811-001	STRIP, relay	1
21	108-7112-020	FUSE – 20 amp	3
22	108-4943-006	RING, terminal – 3/8"	5
23	108-4827-112	TERMINAL, male	6
24	108-4827-121	TERMINAL, female	3
25	108-4827-122	TERMINAL, female	10
26	108-4827-006	CONNECTOR, 3-way female	1
27	108-4827-009	CONNECTOR, 6-way male	2
28	108-4827-008	CONNECTOR, 4-way female	1
29	108-4827-130	SEAL, cable	19
30	108-4827-134	PLUG, cavity	1
31	108-7114-010	FEMALE QDC	6
32	108-5717-003	CONNECTOR, butt	6

PACKARD CONNECTION KIT 108-4827



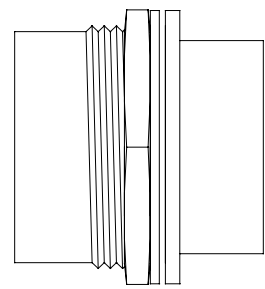
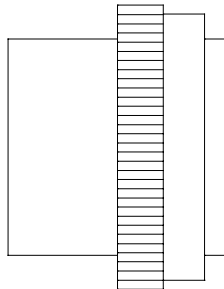
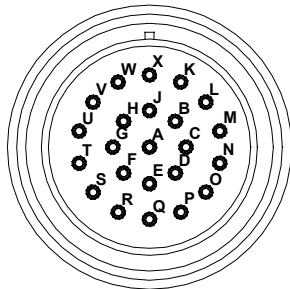
**PACKARD CONNECTION KIT
108-4827**

REF	PART NO.	DESCRIPTION	REQ'D
1	108-4827-001	CONNECTION, 1-way male	20
2	108-4827-002	CONNECTION, 1-way female	20
3	108-4827-003	CONNECTION, 2-way male	20
4	108-4827-004	CONNECTION, 2-way female	20
5	108-4827-005	CONNECTION, 3-way male	20
6	108-4827-006	CONNECTION, 3-way female	20
7	108-4827-007	CONNECTION, 4-way male	20
8	108-4827-008	CONNECTION, 4-way female	20
9	108-4827-009	CONNECTION, 6-way male	20
10	108-4827-010	CONNECTION, 6-way female	20
11	108-4827-110	TERMINAL, male (18-20 AWG)	60
	108-4827-111	TERMINAL, male (16-14 AWG)	200
	108-4827-112	TERMINAL, male (10-12 AWG)	60
12	108-4827-120	TERMINAL, female (18-20 AWG)	60
	108-4827-121	TERMINAL, female (16-14 AWG)	200
	108-4827-122	TERMINAL, female (10-12 AWG)	60
13	108-4827-130	SEAL, cable – (20 GA)	20
	108-4827-131	SEAL, cable – (18 GA)	100
	108-4827-132	SEAL, cable – (16-14 GA)	400
	108-4827-133	SEAL, cable – (12 GA)	100
14	108-4827-134	PLUG, cavity	20
15	108-4828-001	TOOL, installation	1
16	108-4828-002	TOOL, removal	1
17	108-4827-014	SEAL, 1-way female connection	A/R
18	108-4827-015	SEAL, 2-way female connection	A/R
19	108-4827-016	SEAL, 3-way female connection	A/R
20	108-4827-017	SEAL, 4-way female connection	A/R
21	108-4827-018	SEAL, 6-way female connection	A/R

FORMULA 4000**DEUTSCH CONNECTION KIT
108-6461-PC**

REF	PART NO.	DESCRIPTION	REQ'D
1	108-6461-03P	PLUG, 3-way	15
2	108-6461-3PW	WEDGE, 3-way plug	15
3	108-6461-03R	RECEPTICLE, 3-way	15
4	108-6461-3RW	WEDGE, 3-way recepticle	15
5	108-6461-04P	PLUG, 4-way	3
6	108-6461-4PW	WEDGE, 4-way plug	3
7	108-6461-04R	RECEPTICLE, 4-way	3
8	108-6461-4RW	WEDGE, 4-way recepticle	3
9	108-6461-06P	PLUG, 6-way	3
10	108-6461-6PW	WEDGE, 6-way plug	3
11	108-6461-06R	RECEPTICLE, 6-way	3
12	108-6461-6RW	WEDGE, 6-way recepticle	3
13	108-6461-08P	PLUG, 8-way	3
14	108-6461-8PW	WEDGE, 8-way plug	3
15	108-6461-08R	RECEPTICLE, 8-way	3
16	108-6461-8RW	WEDGE, 8-way recepticle	3
17	108-6461-12P	PLUG, 12-way	3
18	108-6461-12PW	WEDGE, 12-way plug	3
19	108-6461-12R	RECEPTICLE, 12-way	3
20	108-6461-CRW	WEDGE, 12-way recepticle	3
21	108-6461-100	PLUG, sealing	25
22	108-6461-101	PIN, gold plated	200
23	108-6461-102	SOCKET, gold plated	200
24	108-6461-201	CRIMPER	1
25	108-6461-202	TOOL, removal	1

**CONNECTORS, PLUGS, PINS and ACCESSORIES for
DEUTSCH ELECTRICAL PARTS
108-4815**



<u>PINS & SOCKETS</u>	
HEIL PART NUMBER	DESCRIPTION
108-4815-101	PIN (6 GA)
108-4815-102	SOCKET (6 GA)
108-4815-103	SEALING PLUG (6 GA)
108-4815-104	PIN (8-10 GA)
108-4815-105	SOCKET (8-10 GA)
108-4815-106	SEALING PLUG (8-10 GA)
108-4815-107	PIN (12-14 GA)
108-4815-108	SOCKET (12-14 GA)
108-6461-100	SEALING PLUG (12-14 GA)
108-4815-110	PIN (16-18 GA)
108-4815-111	SOCKET (16-18 GA)
108-6461-100	SEALING PLUG (16-18 GA)
108-4815-112	PIN (20-24 GA)
108-4815-113	SOCKET (20-24 GA)
108-4815-114	SEALING PLUG (20-24 GA)

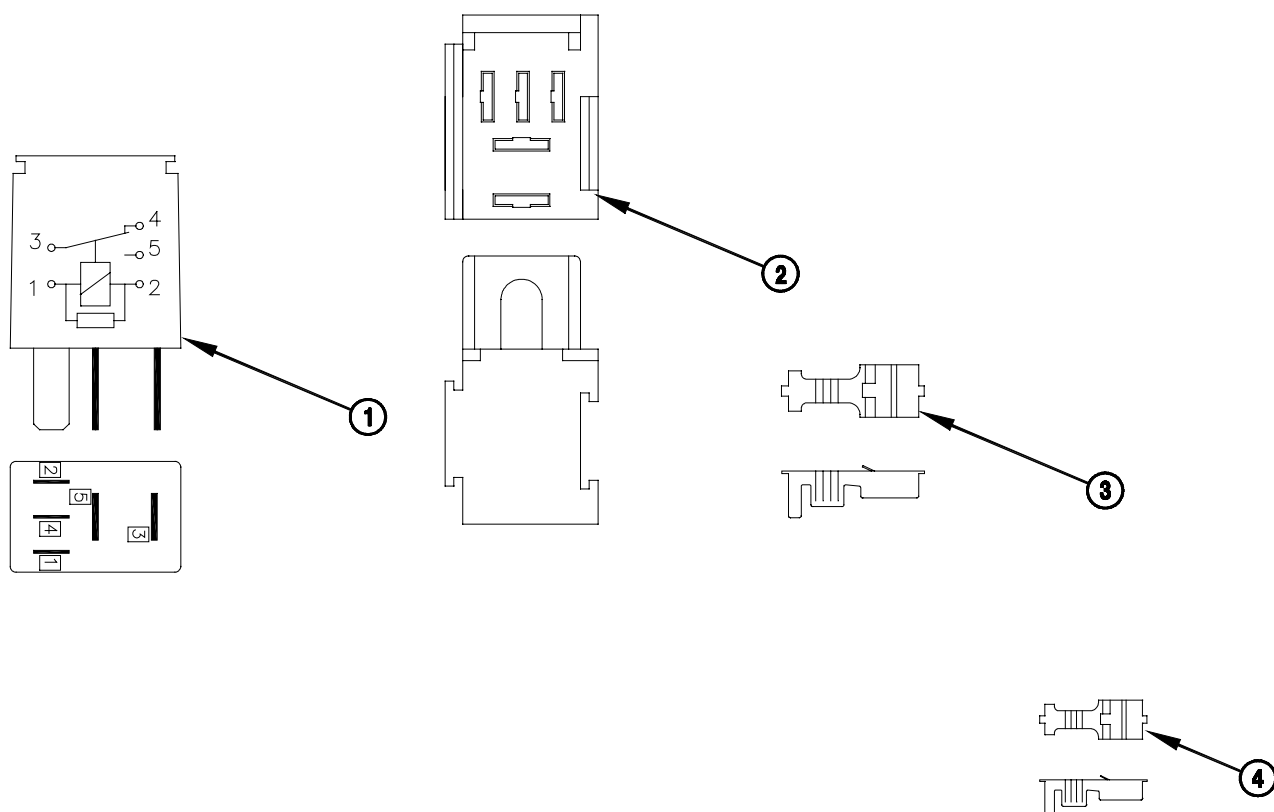
<u>GOLD PINS & SOCKETS</u>	
HEIL PART NUMBER	DESCRIPTION
108-4815-120	PIN (12-14 GA)
108-6461-121	SOCKET (12-14 GA)
108-4815-124	PIN (14-16 GA)
108-4815-125	SOCKET (14-16 GA)
108-6461-122	PIN (16-18 GA)
108-4815-123	SOCKET (16-18 GA)
108-4815-126	PIN (20-24 GA)
108-4815-127	SOCKET (20-24 GA)

<u>PLASTIC CONNECTOR SHELLS</u>	
108-4815-020	21 (PIN) RECEPTACLE
108-4815-021	21 (SOCKET) PLUG
108-4815-022	19 (PIN) RECEPTACLE
108-4815-023	19 (SOCKET) PLUG
108-4815-024	23 (PIN) RECEPTACLE
108-4815-025	23 (SOCKET) PLUG

<u>ACCESSORIES</u>	
HEIL PART NUMBER	DESCRIPTION
108-4815-150	PANEL NUT, 24 SHELL
108-4815-151	LOCKWASHER, 24 SHELL
108-4815-152	STRAIN RELIEF STRAIGHT 24
108-4815-153	STRAIN RELIEF °90 24
108-4815-154	PANEL NUT, 18 SHELL
108-4815-155	LOCKWASHER, 18 SHELL
108-4815-156	STRAIN RELIEF STRAIGHT 18
108-4815-157	STRAIN RELIEF °90 18
108-4815-158	REMOVAL TOOL (6 GA)
108-4815-159	REMOVAL TOOL (8-10 GA)
108-4815-160	REMOVAL TOOL (12-14 GA)
108-4815-161	REMOVAL TOOL (16-18 GA)
108-4815-162	REMOVAL TOOL (20-24 GA)
108-4815-163	CRIMP TOOL (12-24 GA)
108-4815-164	CRIMP TOOL (6-10 GA)
108-4815-165	RECEPTACLE CAP, 18 PIN
108-4815-166	RECEPTACLE CAP, 24 PIN
108-4815-167	PLUG CAP, 18 PIN
108-4815-168	PLUG CAP, 24 PIN
108-4815-169	----
108-4815-170	DT SCREWDRIVER TOOL

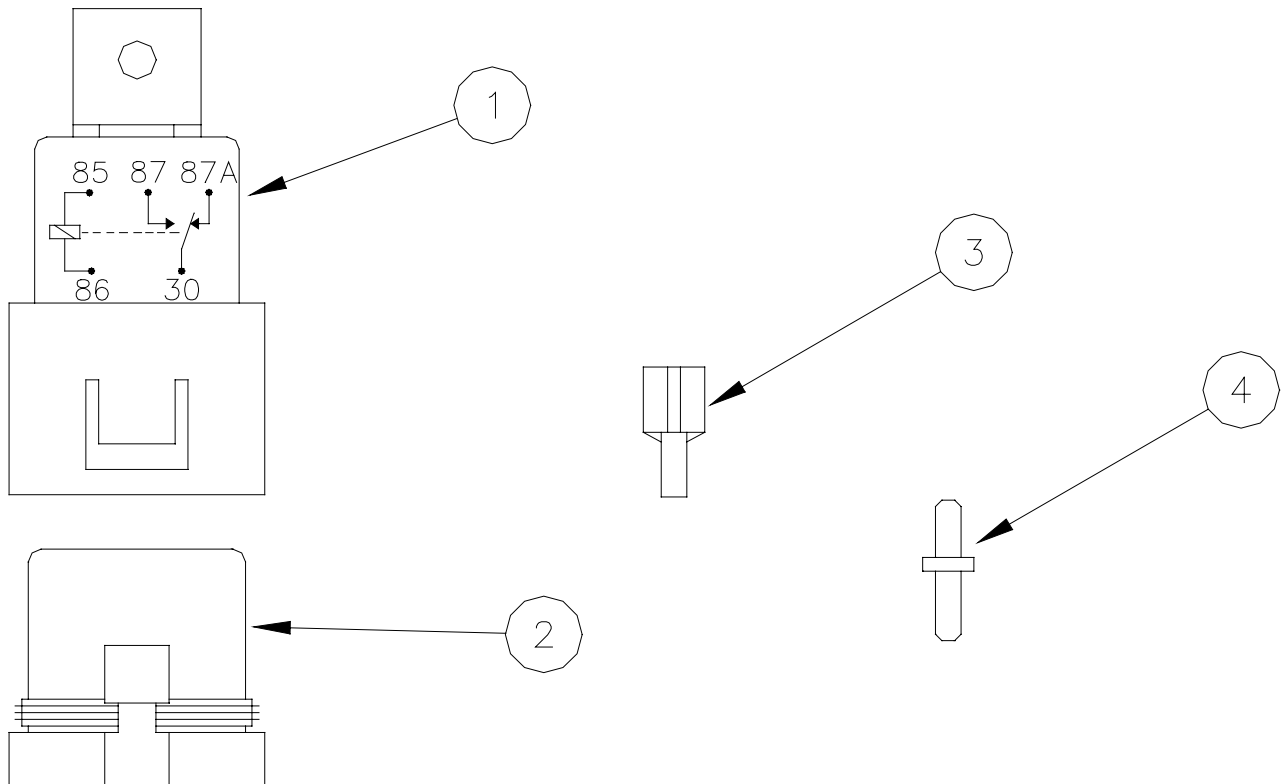
<u>METAL CONNECTOR SHELLS</u>	
HEIL PART NUMBER	DESCRIPTION
108-4815-001	21 (PIN) RECEPTACLE
108-4815-002	21 (SOCKET) PLUG
108-4815-003	31 (PIN) RECEPTACLE
108-4815-004	31 (SOCKET) PLUG
108-4815-005	23 (PIN) RECEPTACLE
108-4815-006	23 (SOCKET) PLUG
108-4815-007	16 (PIN) RECEPTACLE
108-4815-008	16 (SOCKET) PLUG
108-4815-009	14 (PIN) RECEPTACLE (16 GA)
108-4815-010	14 (SOCKET) PLUG (16 GA)
108-4815-015	35 (PIN) RECTL(3-16GA, 32-20GA)
108-4815-016	35 (SOC) PLUG(3-16GA, 32-20GA)

MICRO RELAY KIT 069-0032



**MICRO RELAY KIT
069-0032**

REF	PART NO.	DESCRIPTION	REQ'D
1	069-0032-001	RELAY – 12V	1
2	069-0032-002	CONNECTOR.....	1
3	069-0032-003	TERMINAL – 1/4"	2
4	069-0032-004	TERMINAL – 3/16"	3

**RELAY
108-6752**

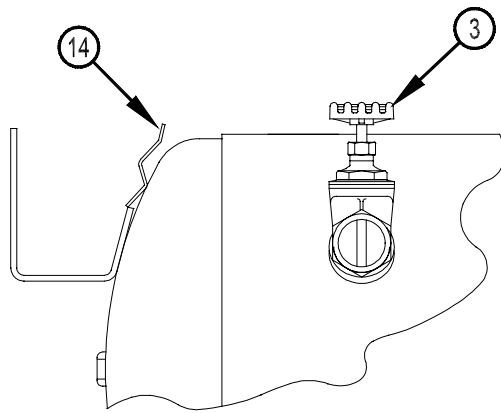
**RELAY
108-6752**

REF	PART NO.	DESCRIPTION	REQ'D
1	108-6752-001	RELAY.....	1
2	108-6752-002	CONNECTOR.....	1
3	108-6752-003	TERMINAL.....	4
4	108-6752-004	PLUG.....	1

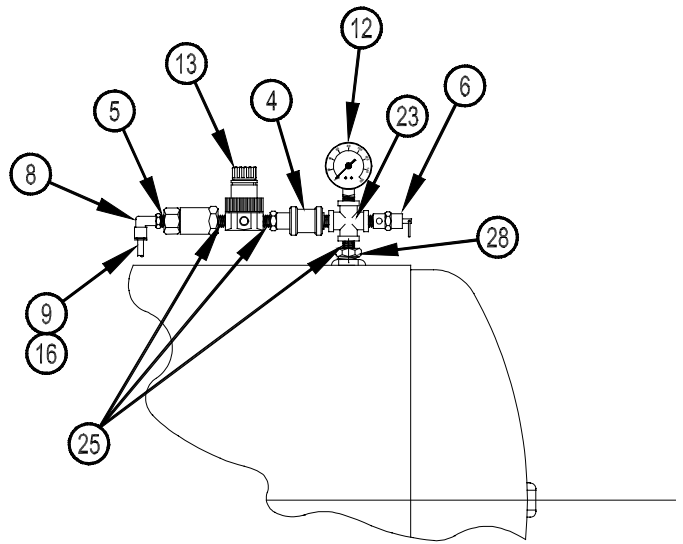
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Buzzer Kit (108-3993)	7.5
Tool Box Kit (272-8560).....	7.7
High Pressure Filter Kit (272-3284)	7.9
High Pressure Oil Filter (075-0705)	7.11
Safety Mirror Kit – Cab Over (372-0300)	7.13
Safety Mirror Kit – Standard Cab (372-0301)	7.15
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Hopper Light Kit (372-1572-001/002)	7.25
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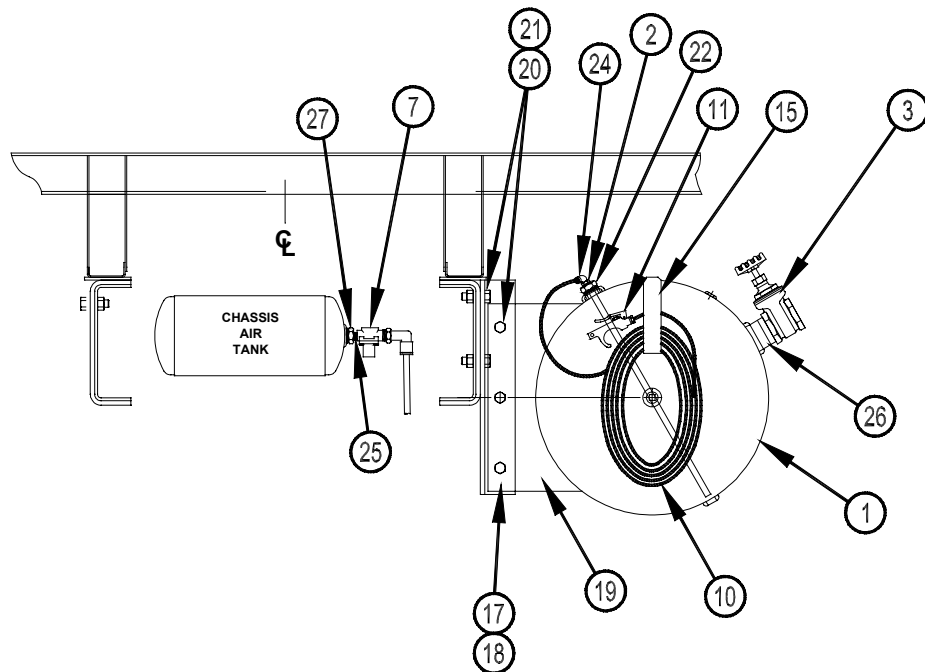
WASHOUT TANK and PARTS **020-1251**



DETAIL "B"



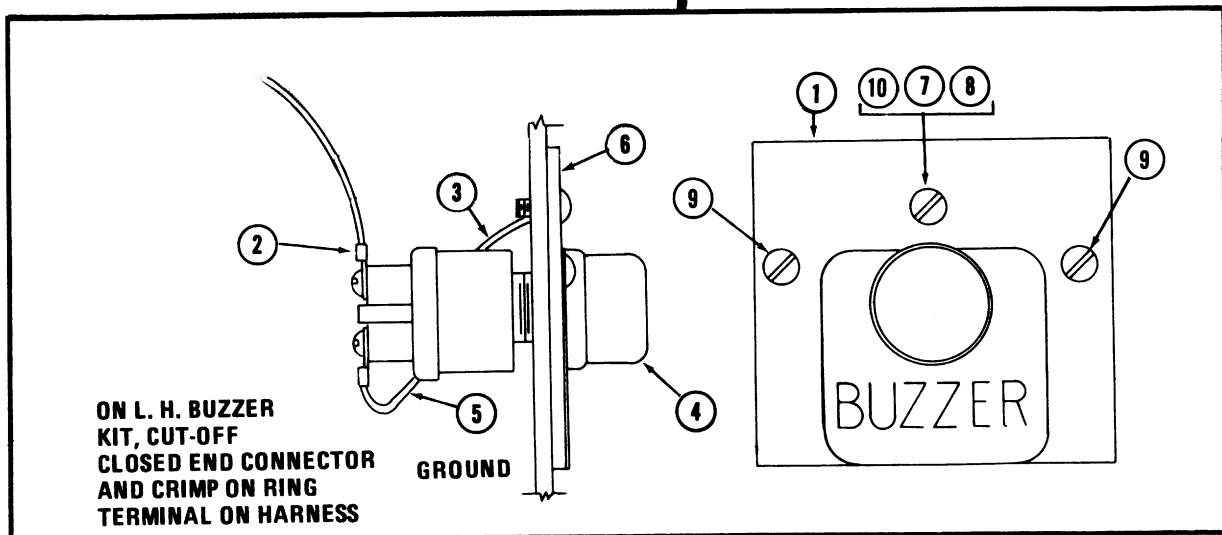
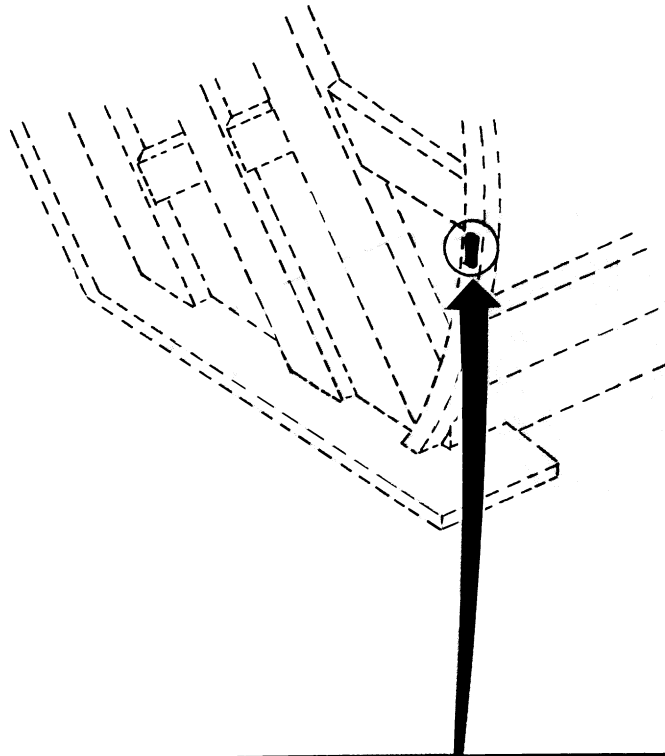
DETAIL "A"



FORMULA 4000**WASHOUT TANK and PARTS
020-1251**

REF	PART NO.	DESCRIPTION	REQ'D
1	020-1971	TANK, washout – 60 gal	1
2	058-8546	PIPE, feed	1
3	031-3421	VALVE, gate	1
4	031-3328	VALVE, slide	1
5	031-1307	VALVE, air check	1
6	031-1774	VALVE, safety	1
7	031-1909	VALVE, pressure protection	1
8	054-8470-004	ELBOW, 90° - 1/4"	1
9	054-5449	LINE, air – 1/4" OD	10ft
10	057-1255	HOSE	1
11	057-1256	GUN, blow	1
12	067-0606	GAUGE, pressure	1
13	067-0625	REGULATOR, pressure	1
14	111-6127-002	CLIP, hose	1
15	211-3798	BRACKET, hose	1
16	263-0045	LOOM – 3/8" ID	10ft
17	272-5095-001	BRACKET – left hand	1
18	272-5095-002	BRACKET – right hand	1
19	272-5095-003	BRACKET	2
20	FS071324	CAPSCREW – 5/8" – 11NC x 1-1/2"	10
21	FS231300	NUT, lock – 5/8" – 11NC	10
22	FS592011	BUSHING, reducing – 1" x 1/2"	1
23	FS690700	CROSS – 1/4" NPT	1
24	FS820700	ELBOW, street - 90° x 1/4"	1
25	FS880700	NIPPLE, close	5
26	FS883000	NIPPLE, close	1
27	FS600907	BUSHING, reducer	1
28	FS591507	BUSHING, reducer – 3/4" x 1/4"	1

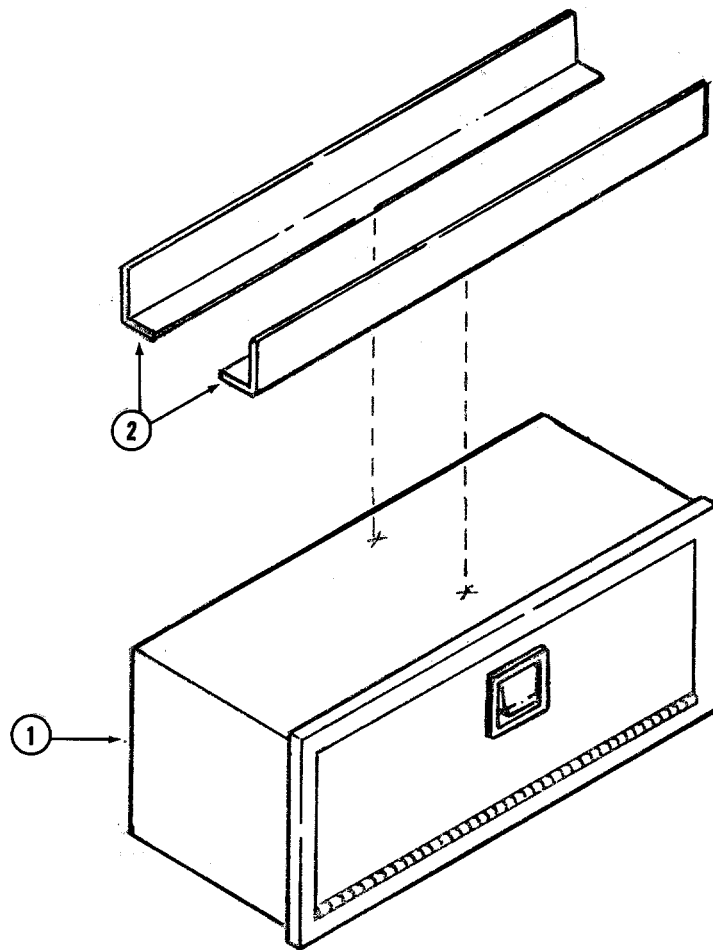
**LEFT HAND BUZZER KIT
108-3993**



**LEFT HAND BUZZER KIT
108-3993**

REF	PART NO.	DESCRIPTION	REQ'D
-	108-3993	KIT, left hand buzzer , (consists of items 1 thru 10)	1
1	022-3079	GASKET	1
2	108-0025	TERMINAL, ring.....	2
3	108-0432	WIRE, lead – white	1
4	108-1113	SWITCH, buzzer	1
5	108-3648-001	WIRE, lead – blue	1
6	112-6125	COVER	1
7	FS280300	NUT - #8 – 32NC	1
8	FS420313	SCREW - #8 – 32NC x 5/8"	1
9	FS500715	SCREW, tek – 1/4" x 3/4"	2
10	FS550300	WASHER, lock - #8	1

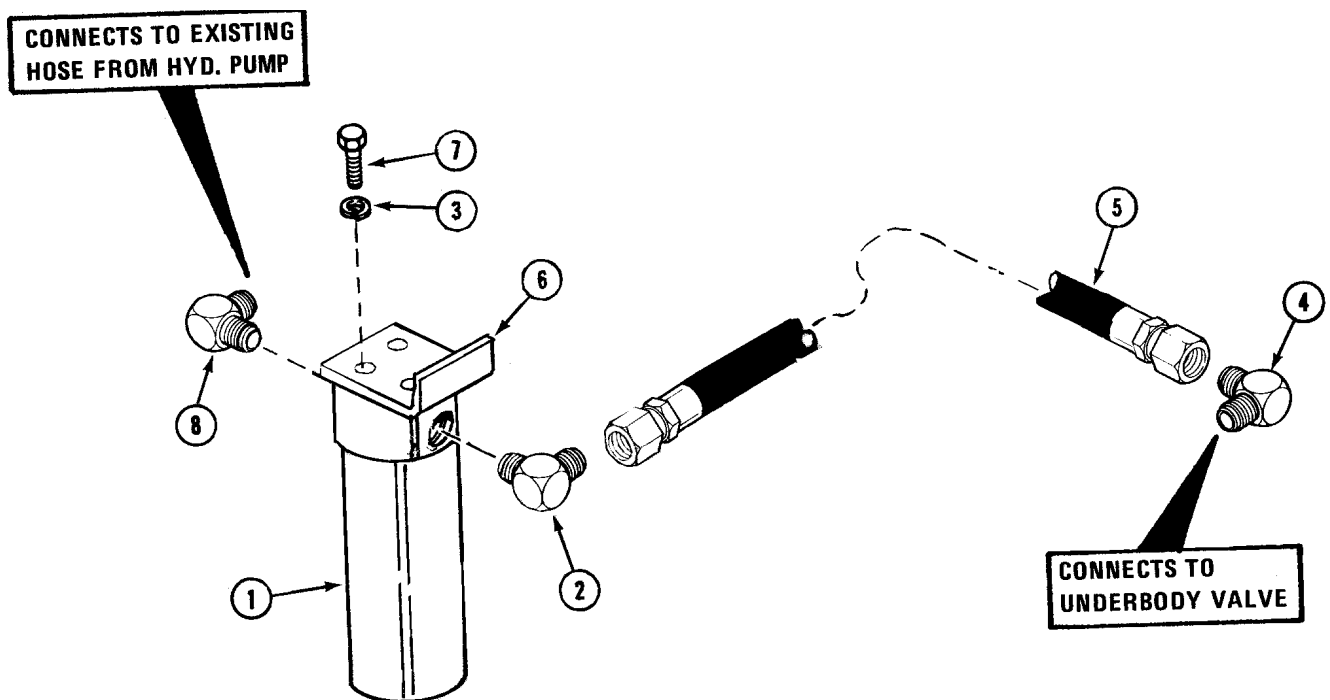
TOOL BOX KIT
272-8560-024 - 24" BOX
272-8560-036 - 36" BOX



TOOL BOX KIT
272-8560-024 - 24" BOX
272-8560-036 - 36" BOX

REF	PART NO.	DESCRIPTION	REQ'D
1	151-1336-024	BOX, tool – 24" box	1
	151-1336-036	BOX, tool – 36" box	1
2	311-0461	BRACKET	2

HIGH PRESSURE FILTER KIT 272-3284

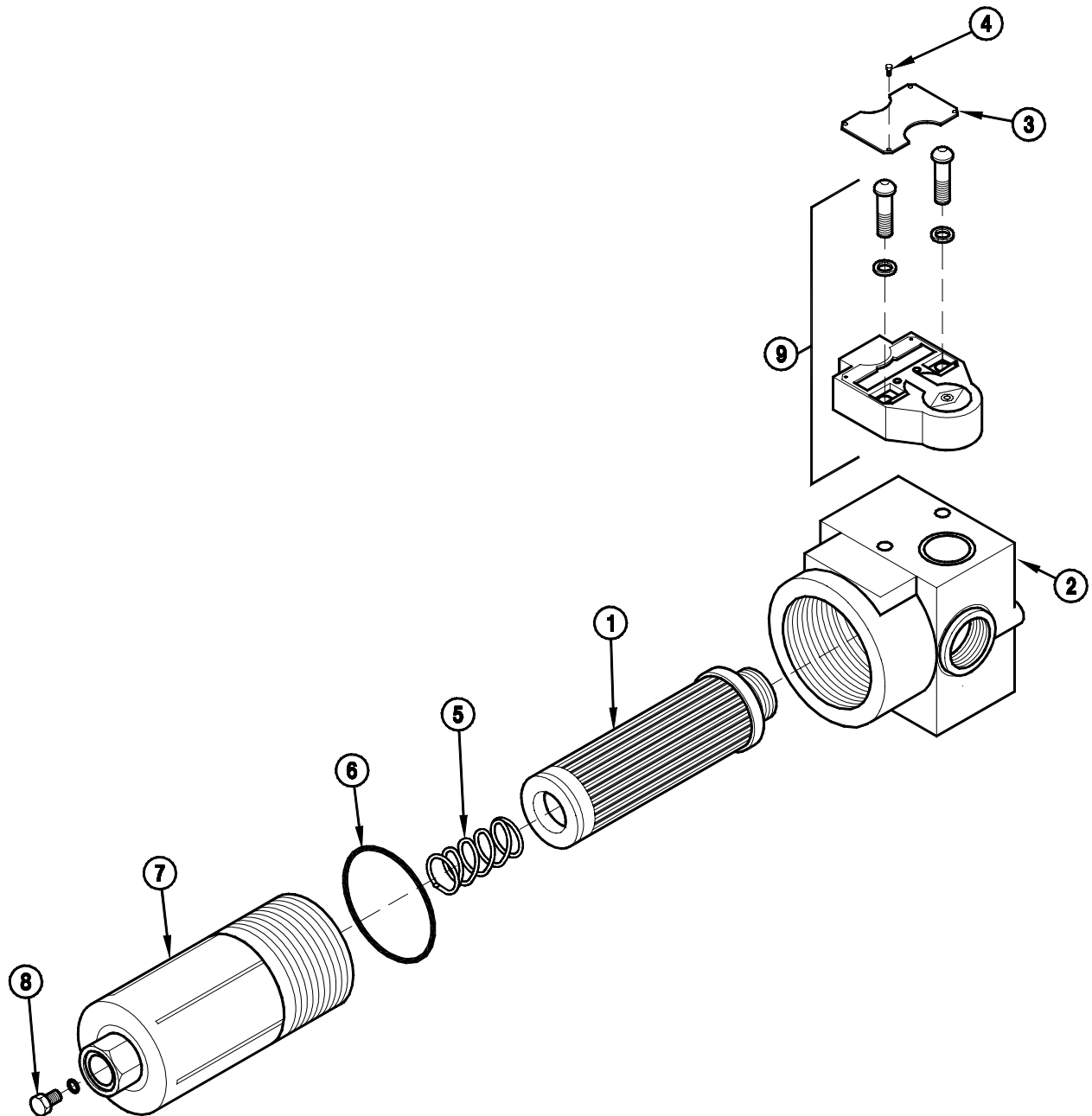


FORMULA 4000

**HIGH PRESSURE FILTER KIT
272-3284**

REF	PART NO.	DESCRIPTION	REQ'D
1	REF.	FILTER, pressure (see section 5).....	1
2	054-3340-010	ELBOW, 90°	1
3	FS550900	WASHER, lock – 3/8”	4
4	054-7324	ELBOW, 90°	1
5	057-1719-001	HOSE, high pressure	1
6	311-0912	BRACKET, filter.....	1
7	FS070915	CAPSCREW – 3/8” – 16NC x 3/4”	4
8	054-4739	ELBOW, 90°	1

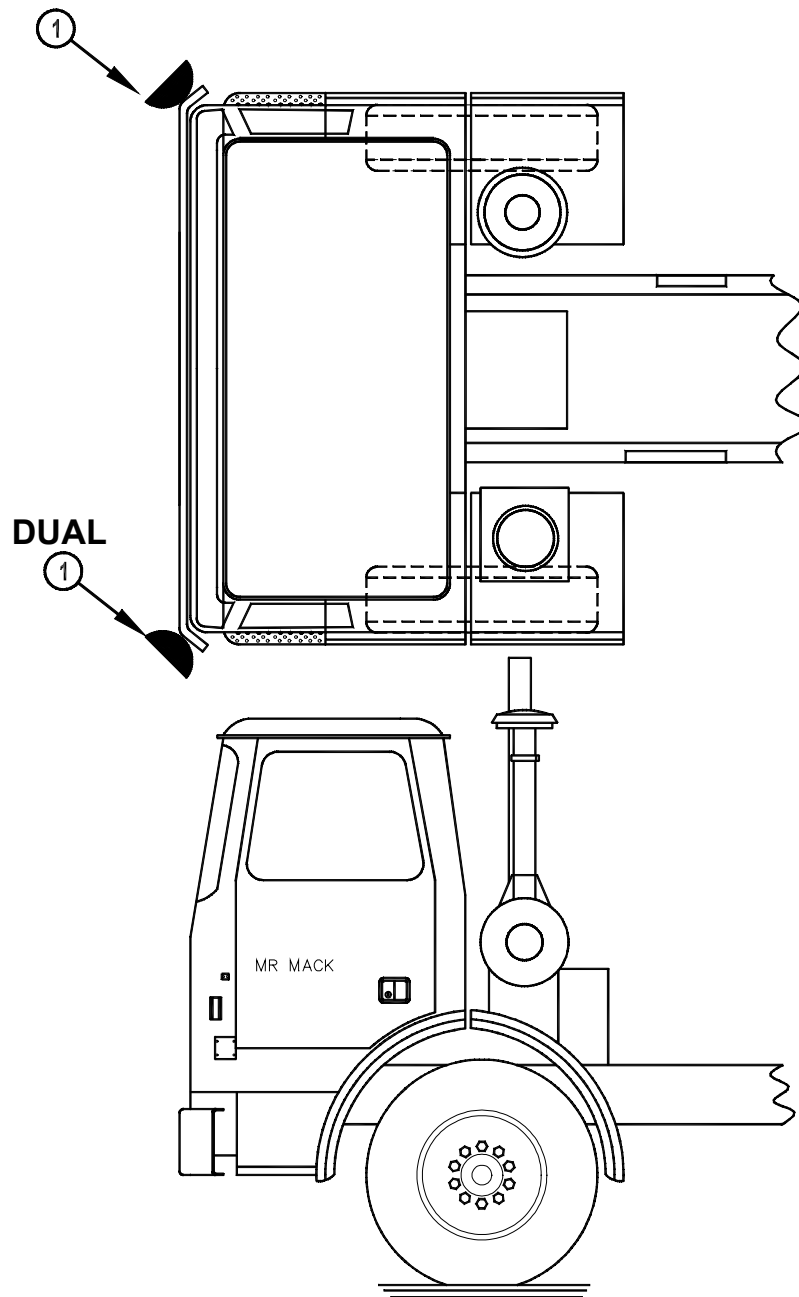
HIGH-PRESSURE HYDRAULIC OIL FILTER 075-0705



**HIGH-PRESSURE HYDRAULIC OIL FILTER
075-0705**

REF	PART NO.	DESCRIPTION	REQ'D
1	075-0705-001	ELEMENT – (10 micron – glass)	1
2	075-0705-002	HEAD ASSEMBLY	1
3	075-0705-003	PLATE, indicator	1
4	075-0705-004	SCREW, drive	2
5	075-0705-005	SPRING	1
6	075-0705-006	O-RING, bowl	1
7	075-0705-007	BOWL, filter	1
8	075-0705-008	PLUG, drain w/plug	1
9	075-0705-009	KIT, indicator	1

SAFETY MIRROR KIT – CAB OVER
372-0300-001 – SINGLE
372-0300-002 - DUAL

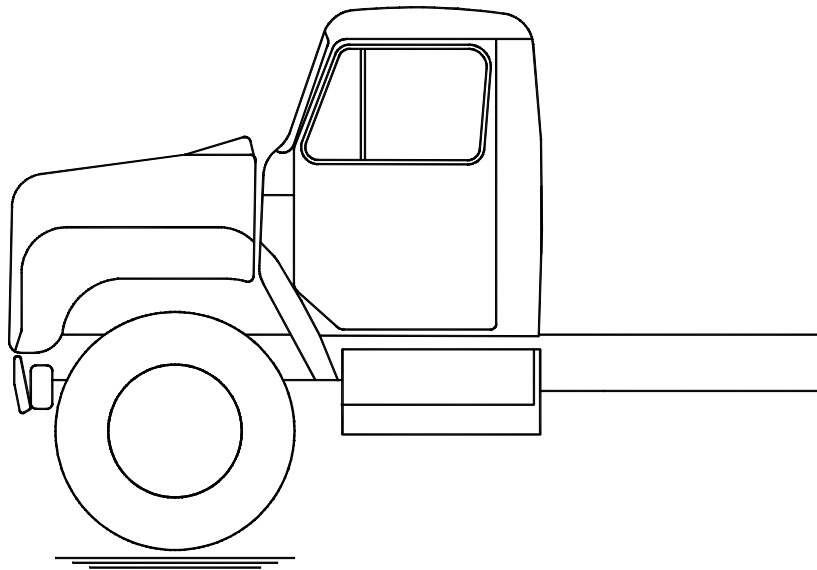
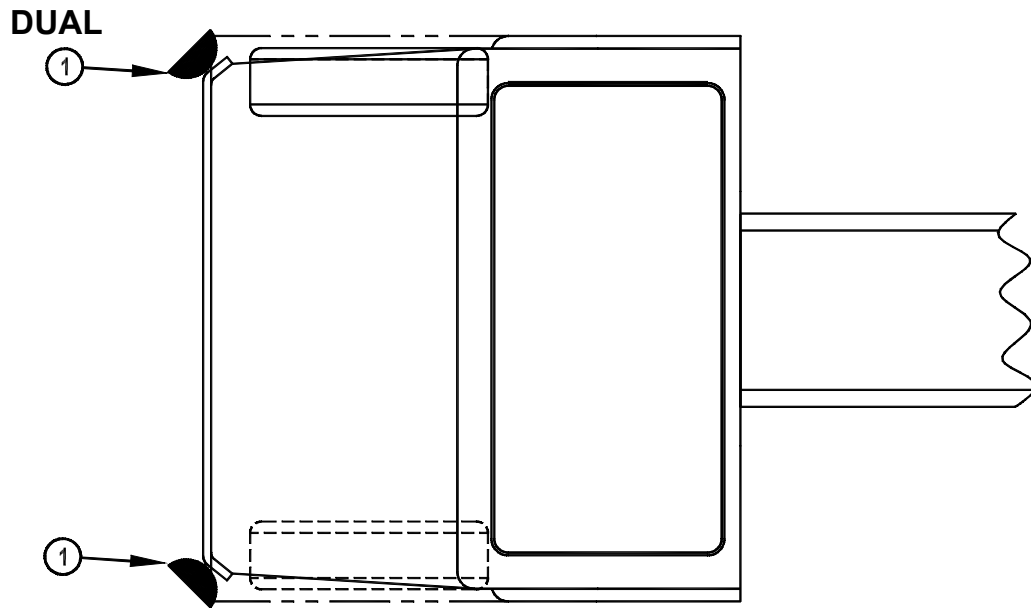


FORMULA 4000

SAFETY MIRROR KIT – CAB OVER
372-0300-001 – SINGLE
372-0300-002 - DUAL

REF	PART NO.	DESCRIPTION	REQ'D
1	161-0349	KIT, safety mirror – (includes mtg hardware)	A/R
	ITEMS 2 THRU 10 NOT SHOWN		
2	108-1814	SWITCH, toggle	1
3	108-4867-007	BREAKER, circuit – 5 amp	1
4	108-4943-002	TERMINAL, ring	2
5	108-5717-002	CONNECTOR, butt – 14-16GA	A/R
6	263-0785-003	CABLE, 3-conductor	A/R
7	212-2615	DECAL, heated mirror	1
8	003-3379	GROMMET, rubber	1
9	108-6461-002	PLUG – for dual kit only	1
10	108-6461-003	PLUG – for dual kit only	1

SAFETY MIRROR KIT – CONVENTIONAL CAB
372-0301-001 – SINGLE
372-0301-002 - DUAL

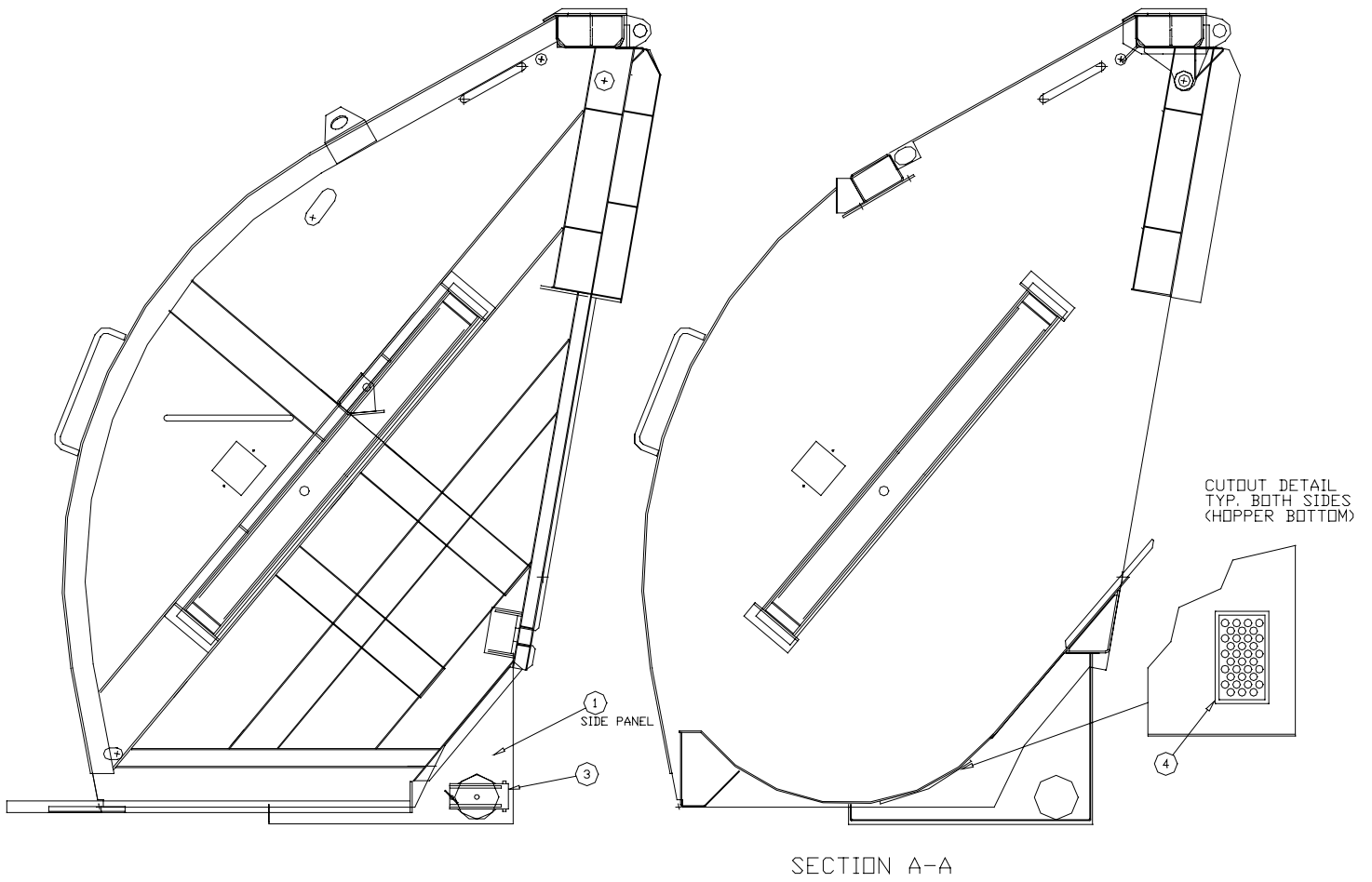


FORMULA 4000

SAFETY MIRROR KIT – CONVENTIONAL CAB
372-0301-001 – SINGLE
372-0301-002 - DUAL

REF	PART NO.	DESCRIPTION	REQ'D
1	161-0350	KIT, safety mirror – (includes mtg hardware)	A/R
	ITEMS 2 THRU 10 NOT SHOWN		
2	108-1814	SWITCH, toggle	1
3	108-4867-007	BREAKER, circuit – 5 amp	1
4	108-4943-002	TERMINAL, ring	2
5	108-5717-002	CONNECTOR, butt – 14-16GA	A/R
6	263-0785-003	CABLE, 3-conductor	A/R
7	212-2615	DECAL, heated mirror	1
8	003-3379	GROMMET, rubber	1
9	108-6461-002	PLUG – for dual kit only	1
10	108-6461-003	PLUG – for dual kit only	1

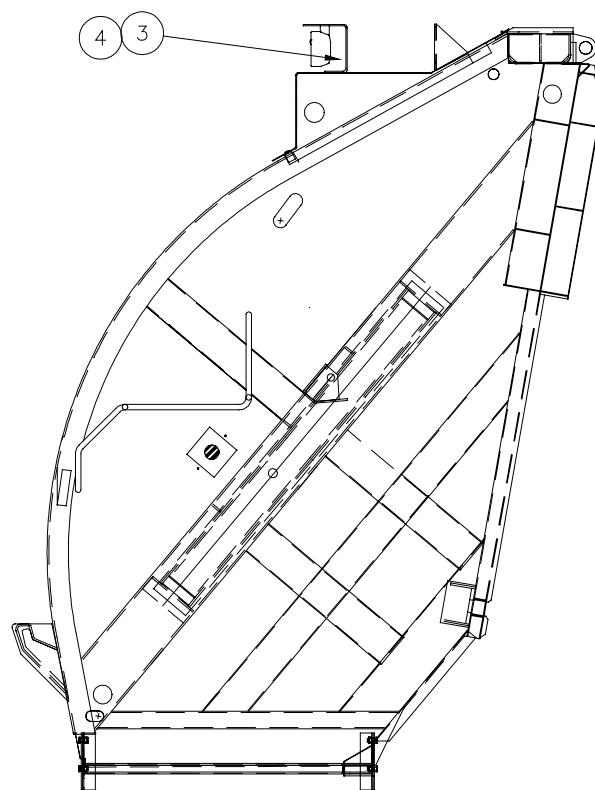
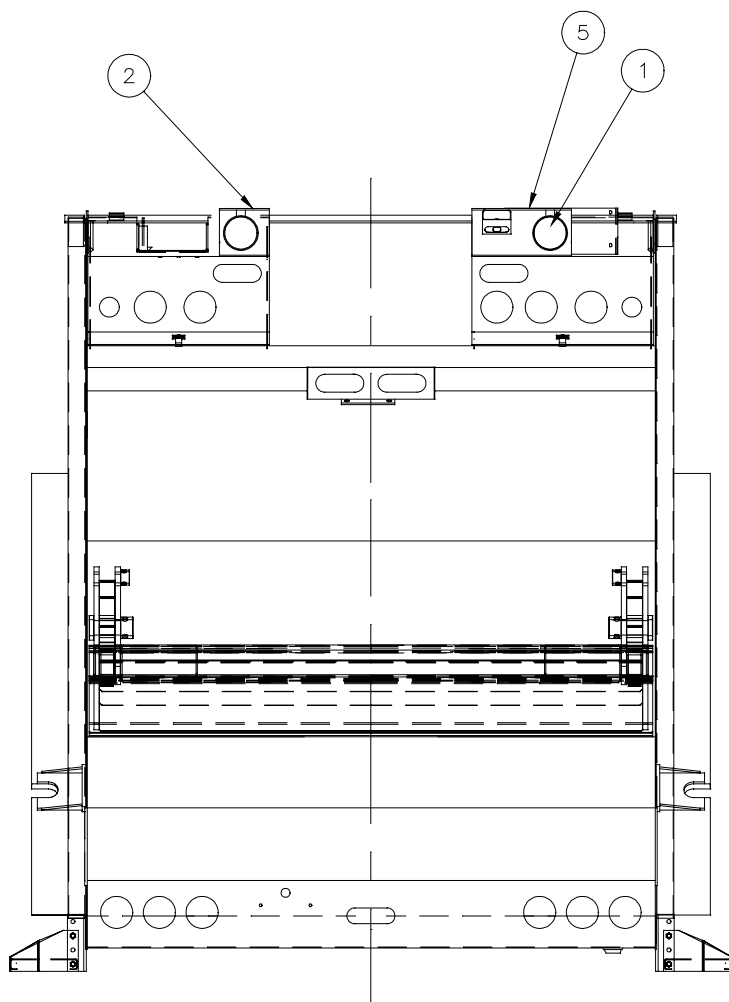
TAILGATE SUMP KIT 272-4972



**TAILGATE SUMP KIT
272-4972**

REF	PART NO.	DESCRIPTION	REQ'D
1	272-4972-001	PANEL, side	2
2	272-4972-002	SUMP	1
3	042-1353	CAP, drain	2
4	112-8045	SCREEN	2

REAR VISION KITS 372-1001



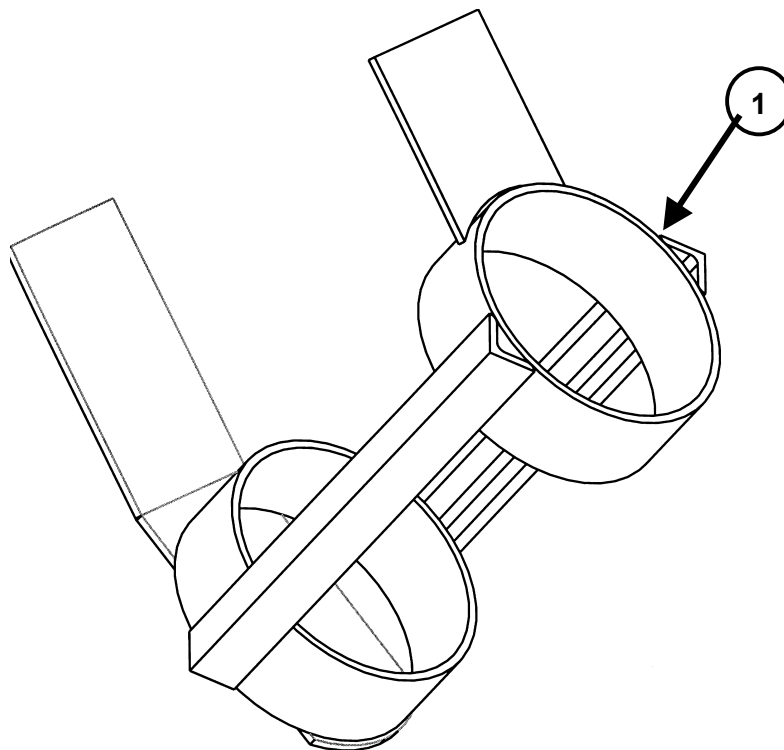
**REAR VISION KITS
372-1001**

REF	PART NO.	DESCRIPTION	REQ'D
1	115-0624	FLOODLIGHT	2
	115-0624-001	LAMP	1
2	311-3077	BRACKET, camera	1
3	FS070922	CAPSCREW – 3/8" – 16NC x 1-3/4"	4
4	FS230900	NUT, lock – 3/8" – 16NC	4
5	311-3078	BRACKET, light and camera	1

CAMERA SYSTEMS

	KIT NO.		
-	372-1001-016	CLARION CC851E with 6" MONITOR	
	161-0174	MONITOR – 6"	1
	161-0166	CAMERA	1
	161-0173	CABLE KIT	1
-	372-1001-028	INTEC HK-1S with HEATER & SHUTTER	
	161-0352-001	CAMERA	1
	161-0352-002	MONITOR	1
	161-0163-003	CABLE	1
-	372-1001-031	GENERIC CAMERA SYSTEM	
	161-0384-001	CAMERA	1
	161-0384-002	MONITOR	1
	161-0384-003	CABLE	1
-	372-1001-001	ECCO K5010 CAMERA with MONITOR	
	161-0371-001	CAMERA	1
	161-0371-002	MONITOR	1
	161-0371-003	CABLE	1
	161-0371-004	CABLE, extension	1

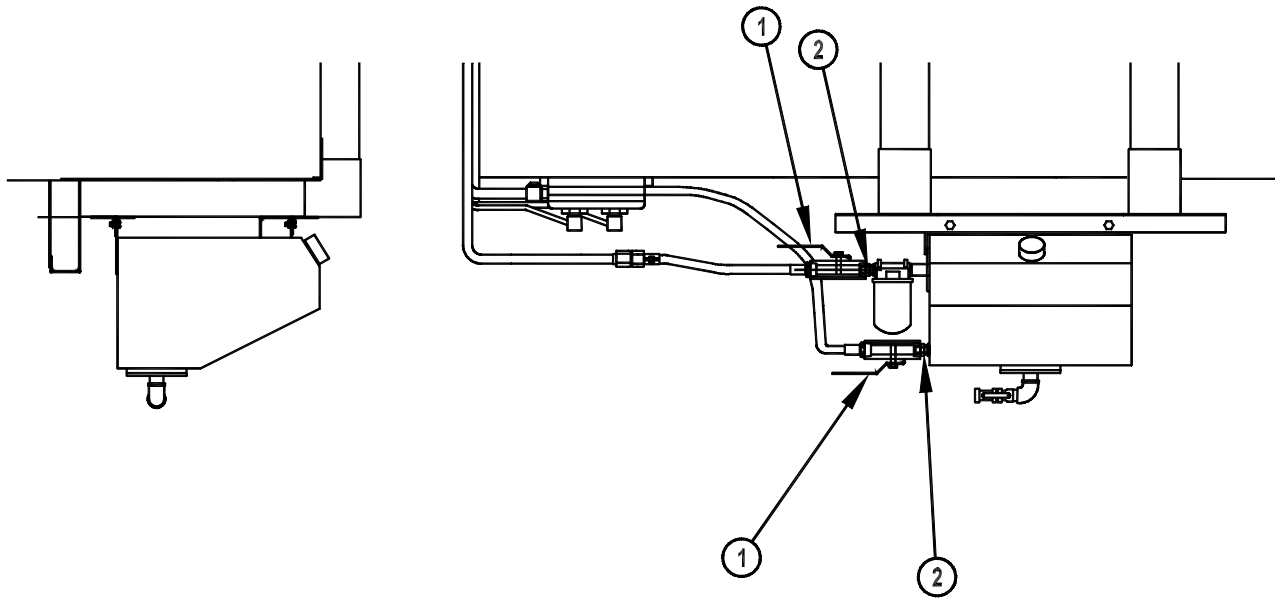
FIRE EXTINGUISHER BRACKET



FIRE EXTINGUISHER BRACKET

REF	PART NO.	DESCRIPTION	REQ'D
1	311-1571	HANGER, fire extinguisher	1
2	161-0345	EXTINGUISHER, fire – 20 Lb. (not shown).....	1

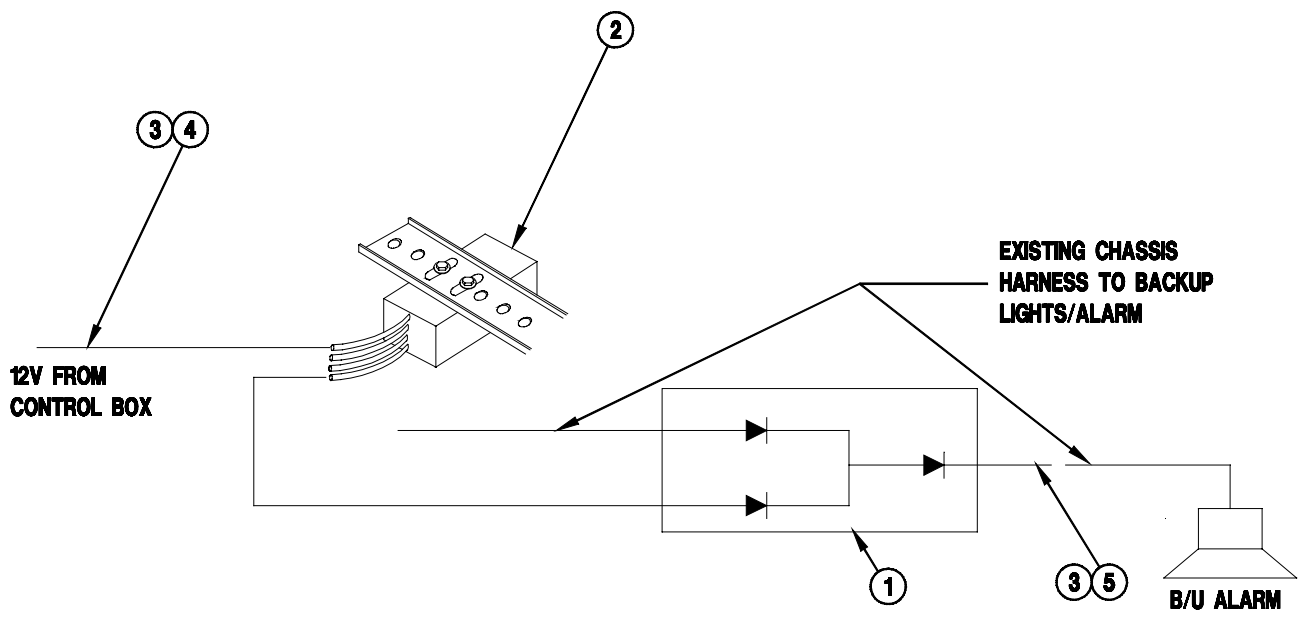
RETURN LINE SHUT-OFF VALVE KIT 272-9179



**RETURN LINE SHUT-OFF VALVE KIT
272-9179**

REF	PART NO.	DESCRIPTION	REQ'D
1	031-5788-001	VALVE, shut-off – 1"	2
2	058-8519-003	NIPPLE, hex – 1"	2

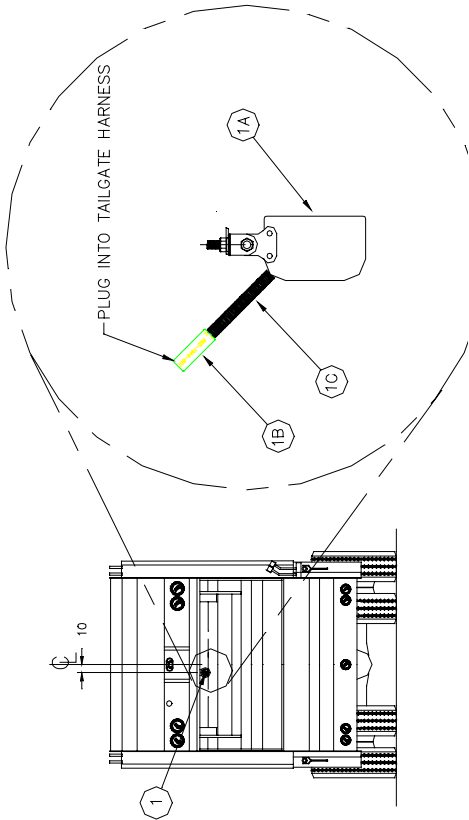
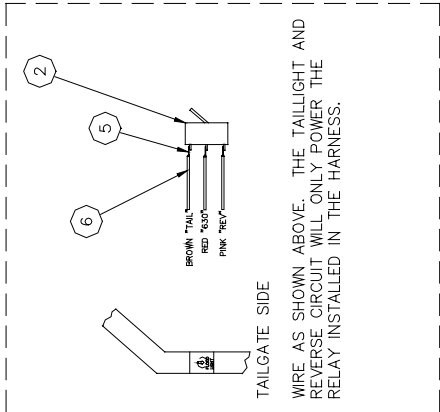
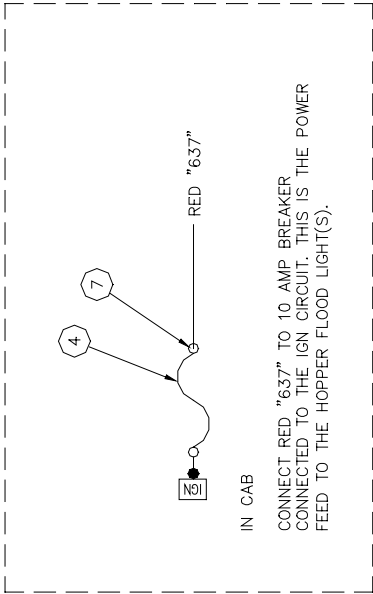
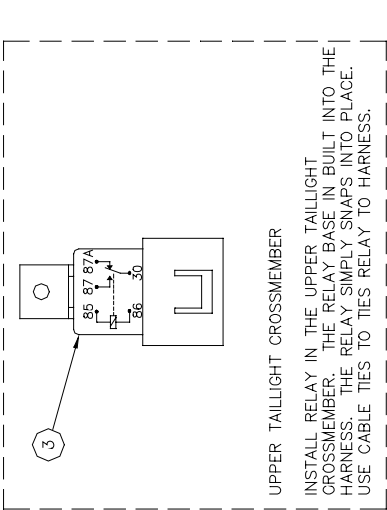
CALIFORNIA BACK-UP ALARM 272-6409



**CALIFORNIA BACK-UP ALARM
272-6409**

REF	PART NO.	DESCRIPTION	REQ'D
1	108-5705	DIODE ASSEMBLY	1
2	272-5594	BACK-UP ALARM & SENSOR.....	1
3	36-1640-208	TIE, plastic.....	20
4	108-4417	FUSE & HOLDER – (20 amp)	1
5	108-5034-001	LOOM, convoluted – 1/4" x 40ft.....	1
6	108-5233-017	WIRE – 16GA – white	20ft
7	108-5233-023	WIRE – 16GA – pink.....	20ft

HOPPER FLOOD LIGHT KIT
372-1572-001 – SINGLE
372-1572-002 – DUAL

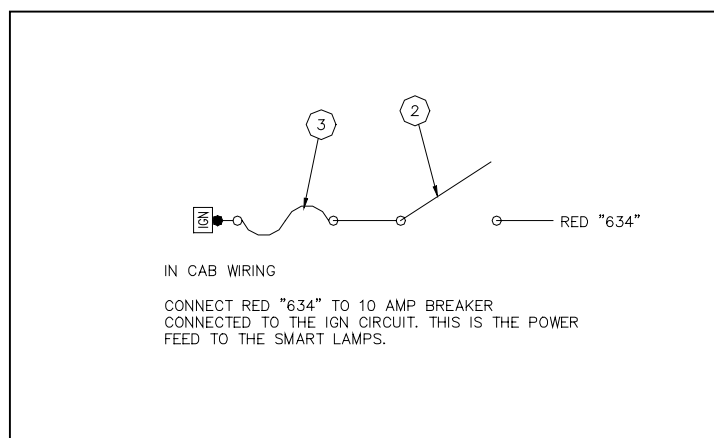
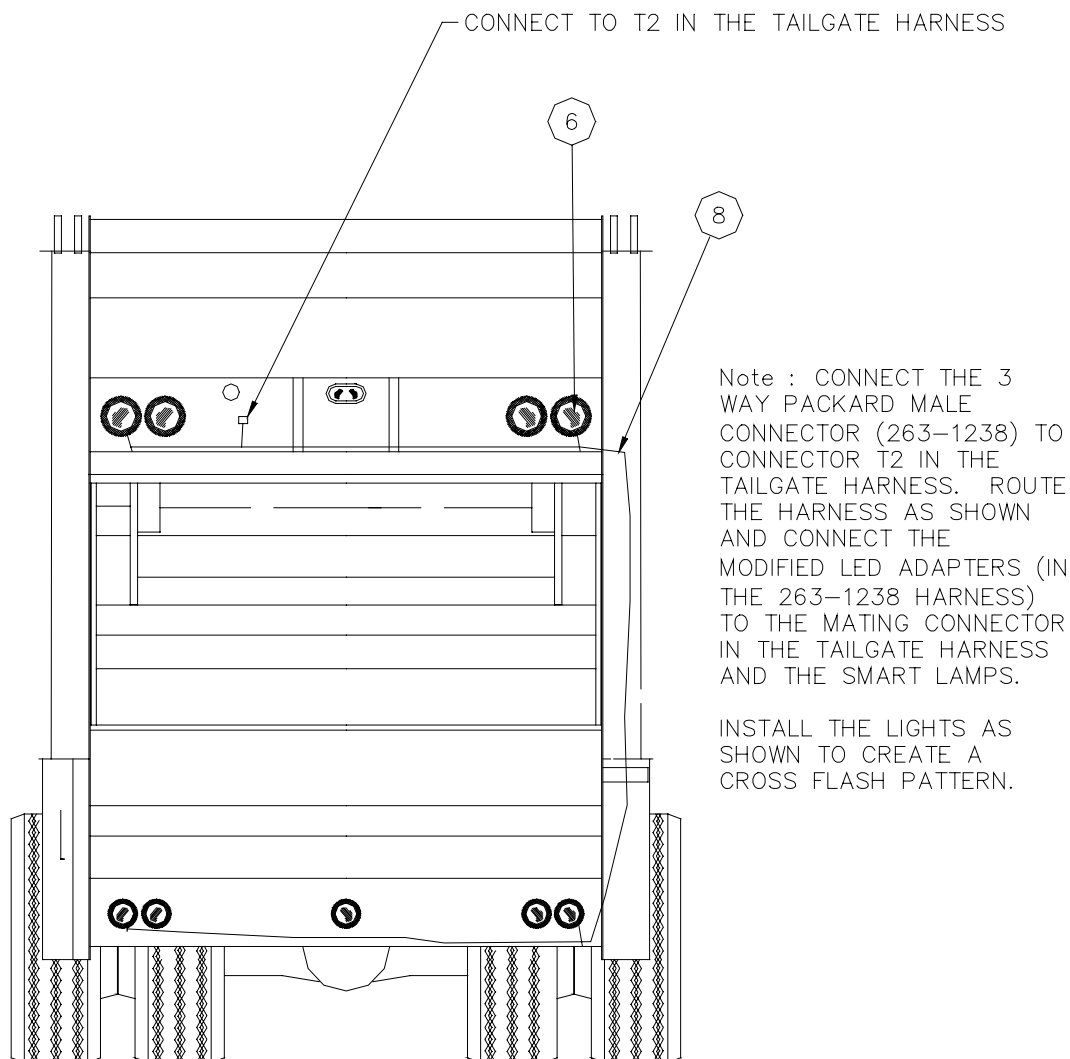


FORMULA 4000

HOPPER FLOOD LIGHT KIT
372-1572-001 – SINGLE
372-1572-002 – DUAL

REF	PART NO.	DESCRIPTION	REQ'D
1	115-1226	LIGHT, flood	A/R
	115-1225	LIGHT	1
	108-6461-012	RECEPTICLE, 2-pin	1
	108-7336-002	LOOM	1 FT
2	108-2282	SWITCH, toggle –(ON-NONE-ON)	1
3	108-6752-001	RELAY	1
4	108-4867-005	BREAKER, circuit – 10 amp	1
5	108-4943-003	TERMINAL, ring - #10	3
6	054-7350	TUBE, shrink	1 ft.
7	108-7114-010	TERMINAL, female	2

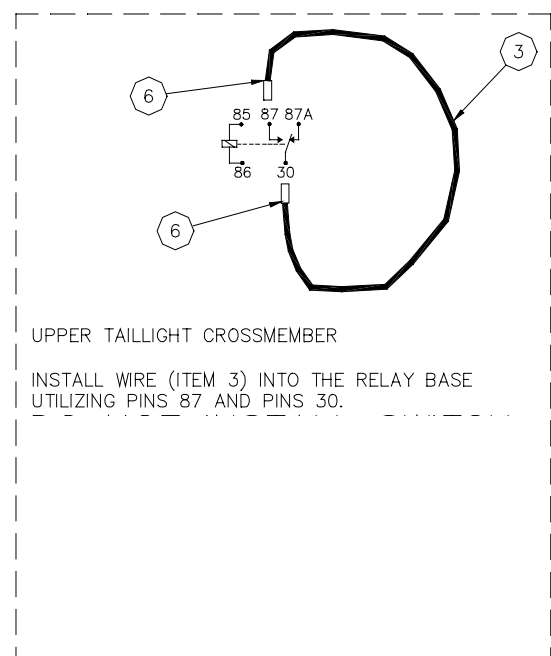
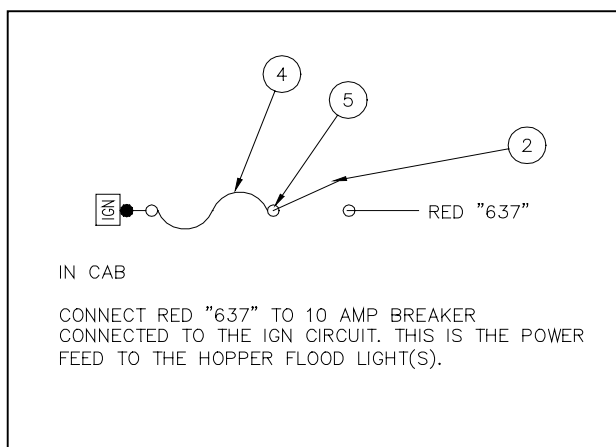
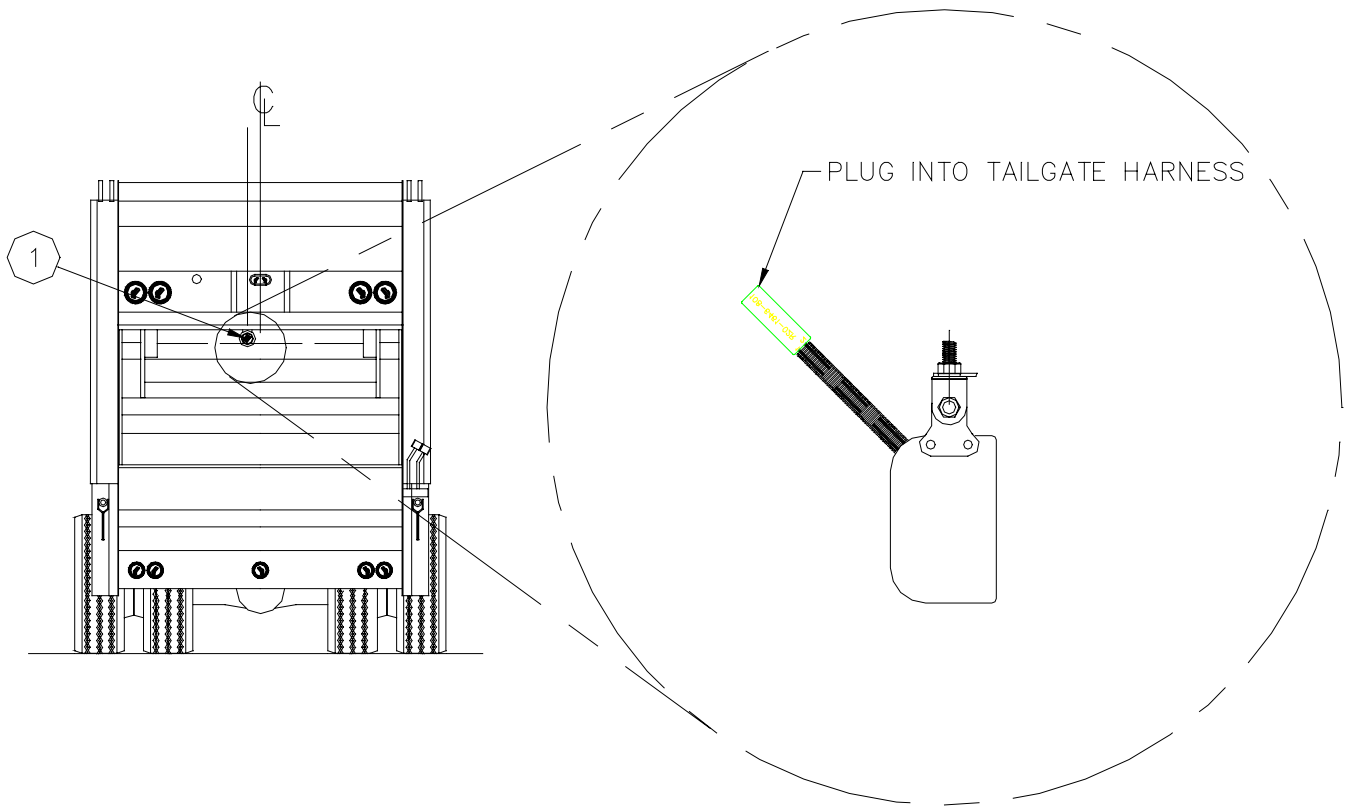
SMART LAMP KIT 372-2913



**SMART LAMP KIT
372-2913**

REF	PART NO.	DESCRIPTION	REQ'D
1	054-7350	TUBE, shrink (not shown).....	12 inch.
2	108-1814	SWITCH, toggle	1
3	108-4867-005	BREAKER, circuit – 10 amp	1
4	108-7114-010	FEMALE QDC (not shown).....	2
6	115-1269-001	LIGHT ASSEMBLY, smart – right hand	2
	115-1269-RGT	LIGHT – 4" amber	1
	115-0742-002	GROMMET, rubber	1
	115-1269-002	LIGHT ASSEMBLY, smart – left hand	2
	115-1269-LFT	LIGHT – 4" amber	1
	115-0742-002	GROMMET, rubber	1
8	263-1238	HARNESS, wire	1

HOPPER FLOOD LIGHT KIT (SWITCH IN CAB)
372-1842-001 – SINGLE LIGHT KIT
372-1842-002 – DUAL LIGHT KIT

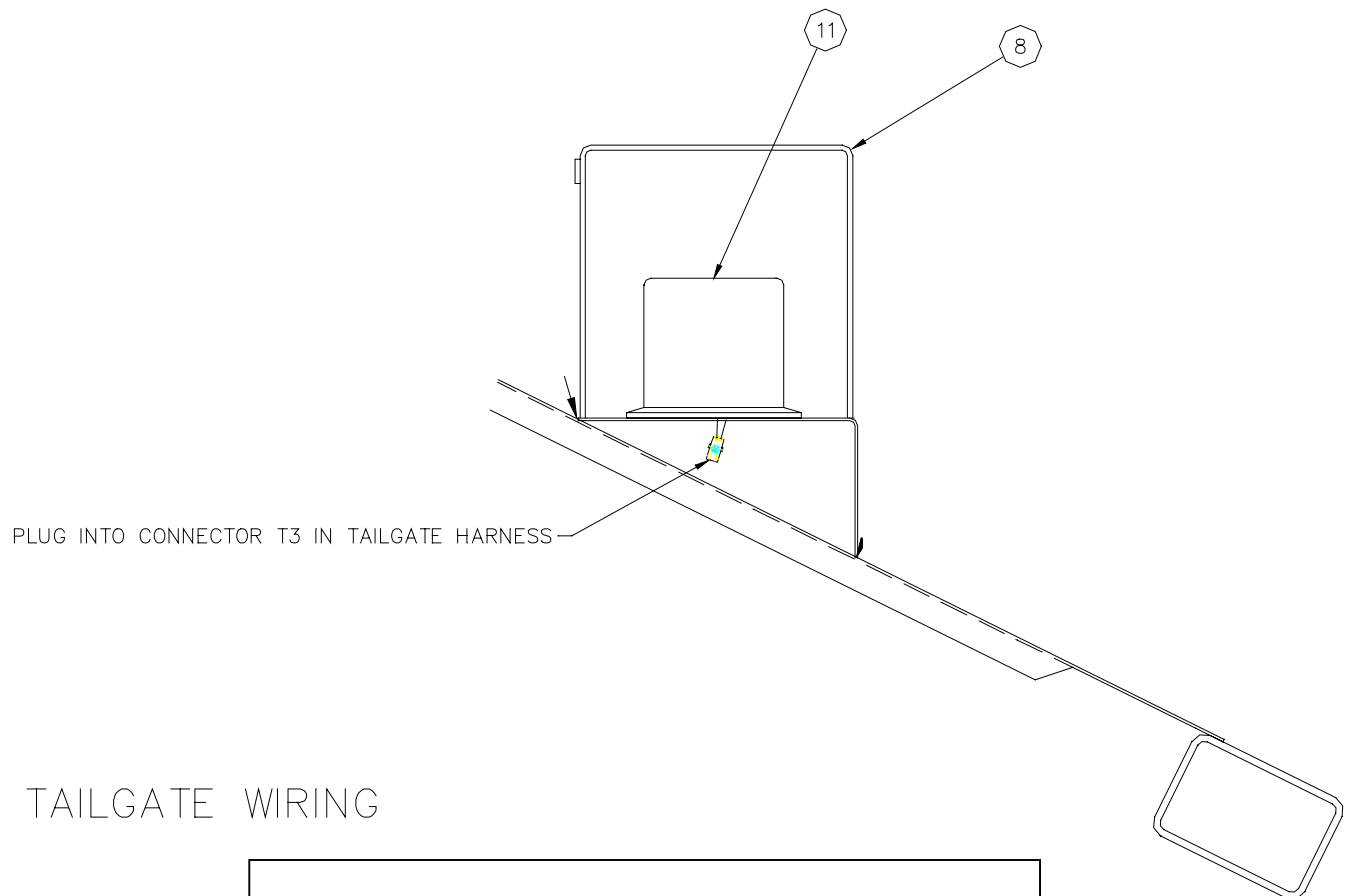


FORMULA 4000

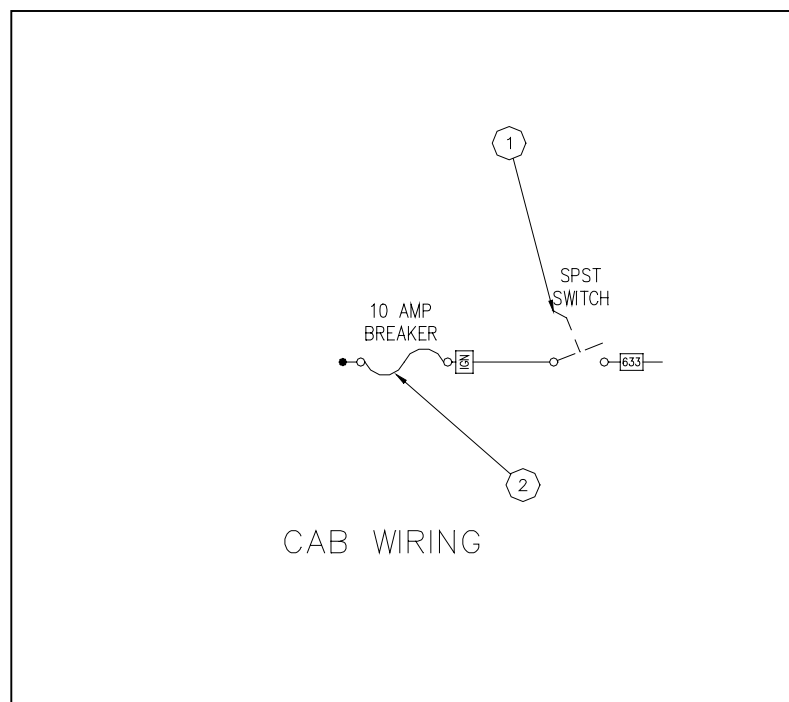
HOPPER FLOOD LIGHT KIT (SWITCH IN CAB)
372-1842-001 – SINGLE LIGHT KIT
372-1842-002 – DUAL LIGHT KIT

REF	PART NO.	DESCRIPTION	REQ'D
1	115-1226	LIGHT, flood	A/R
	115-1225	BULB	1
	108-6461-012	RECEPTICLE, 2-pin	1
	108-7336-002	LOOM – 3/8"	1 ft.
2	108-1814	SWITCH, toggle	1
3	108-2750-006	WIRE – 12 GA – white	6 inch.
4	108-4867-005	BREAKER, circuit – 10 amp	1
5	108-7114-010	TERMINAL, female QDC	2
6	108-7149-006	TERMINAL, male	2

SINGLE BEACON LIGHT on TAILGATE **372-2191-001**



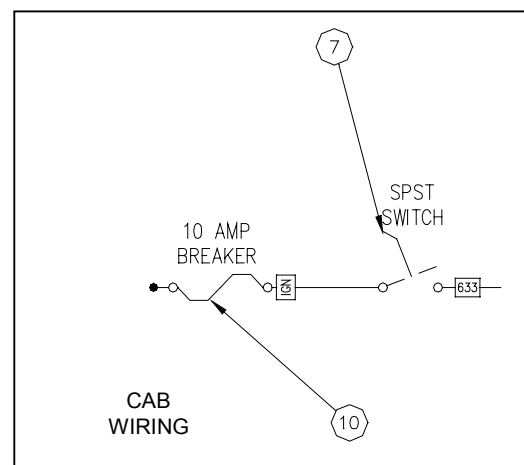
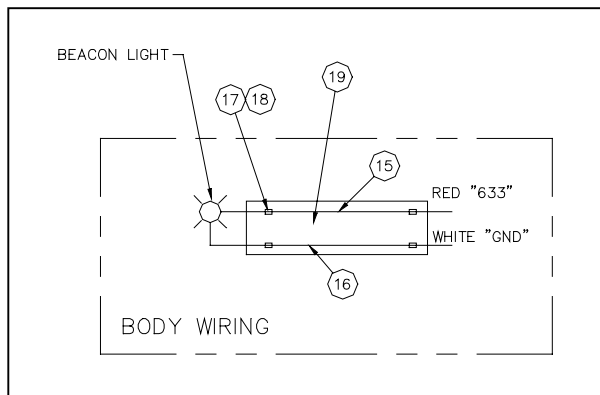
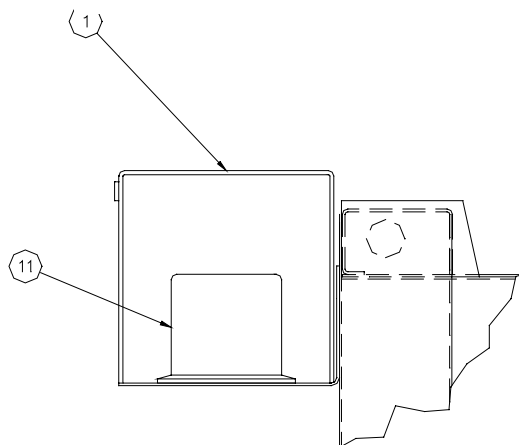
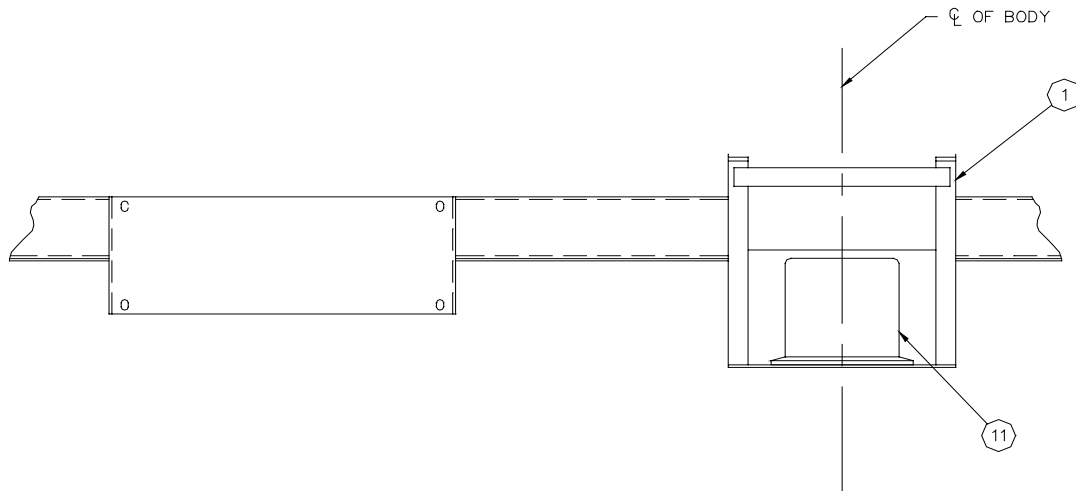
TAILGATE WIRING



**SINGLE BEACON LIGHT on TAILGATE
372-2191-001**

REF	PART NO.	DESCRIPTION	REQ'D
1	108-1814	SWITCH, toggle	1
2	108-4867-005	BREAKER, circuit – 10 amp	1
3	108-4827-005	CONNECTOR, 3-way male	1
4	108-4827-111	TERMINAL, male	2
6	108-0952	GROMMET	1
7	108-4827-132	SEAL, cable	2
8	311-3073	BRACKET, light	1
11	115-0868	LIGHT, beacon – amber	1
	FS240241	SCREW, machine - #10 32 x 1"	3
	FS270440	NUT, hex - #10 – 32	3

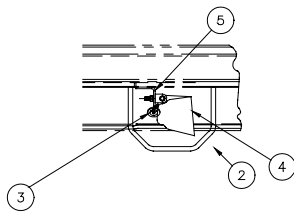
FRONT BEACON LIGHT INSTALLATION KIT 372-2195-001



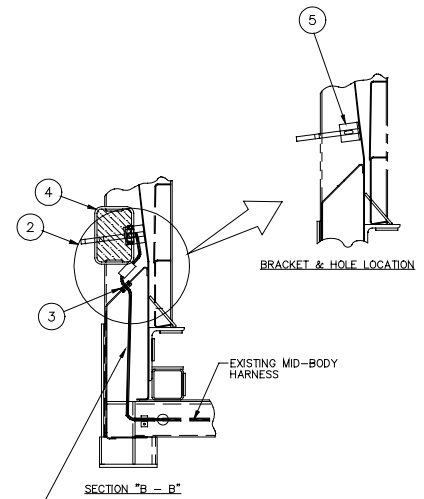
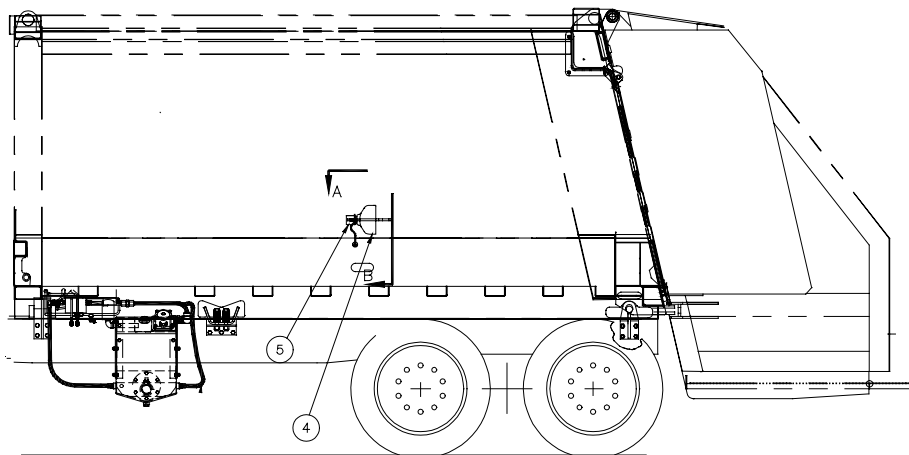
**FRONT BEACON LIGHT INSTALLATION KIT
372-2195-001**

REF	PART NO.	DESCRIPTION	REQ'D
1	113-0233	BRACKET, LIGHT	1
2	036-1115	TIE, plastic.....	8
3	036-1249	CLAMP, loom	12
4	054-7350-002	TUBE, shrink	3
5	108-0432-004	WIRE – RED - #14 GA	1 ft.
6	108-0952	GROMMET	1
7	108-1814	SWITCH, toggle	1
8	108-4330	CONNECTOR, wire	3
9	108-4470	LOOM, electrical – 3/8"	1 ft.
10	108-4867-005	BREAKER, circuit – 10 amp	1
11	115-0868	LIGHT, beacon – amber	1
12	212-0943	DECAL.....	1
13	FS240241	SCREW, machine - #10 – 32 x 1"	3
14	FS270440	NUT, hex - #10 – 32	3
15	108-6716-633	WIRE – RED (633).....	3 ft.
16	108-6716-GND	WIRE – WHITE (GND)	3 ft.
17	108-5717-002	CONNECTOR, butt.....	4
18	054-7350	TUBE, shrink	2 ft.
19	108-4476	LOOM	6 ft.

SIDE MOUNTED FLOOD LIGHT **372-2100-001**

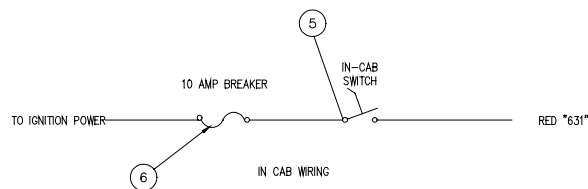


SECTION "A - A"



SECTION "B - B"

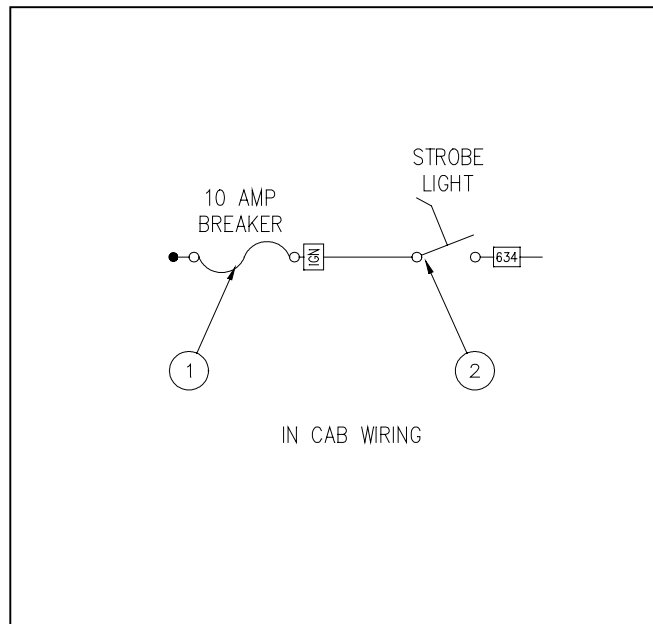
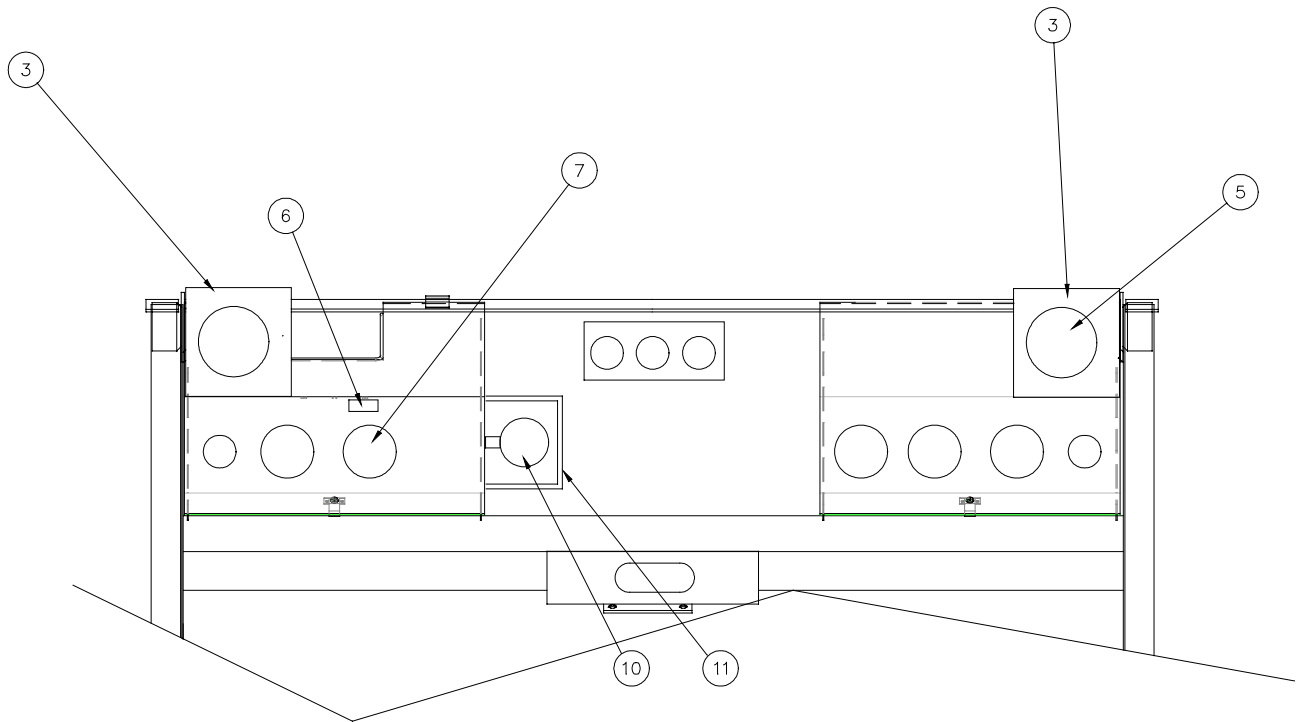
CONNECT TO 2WAY DEUTSCH
 PROVIDED BEHIND MID-BODY
 TURN.



**SIDE MOUNTED FLOOD LIGHT
372-2100-001**

REF	PART NO.	DESCRIPTION	REQ'D
1	108-1814	switch, TOGGLE	1
2	035-3421	GUARD, side mounted light.....	2
3	108-1493	GROMMET	2
4	115-1224	LAMP, trapezoidal with connector	2
	115-0916	LIGHT	1
	108-6461-012	RECEPTACLE, 2-pin.....	1
	108-7336-002	LOOM.....	1 ft
5	311-0655	BRACKET, side light	2
6	108-4867-005	BREAKER, circuit – 10 amp	1

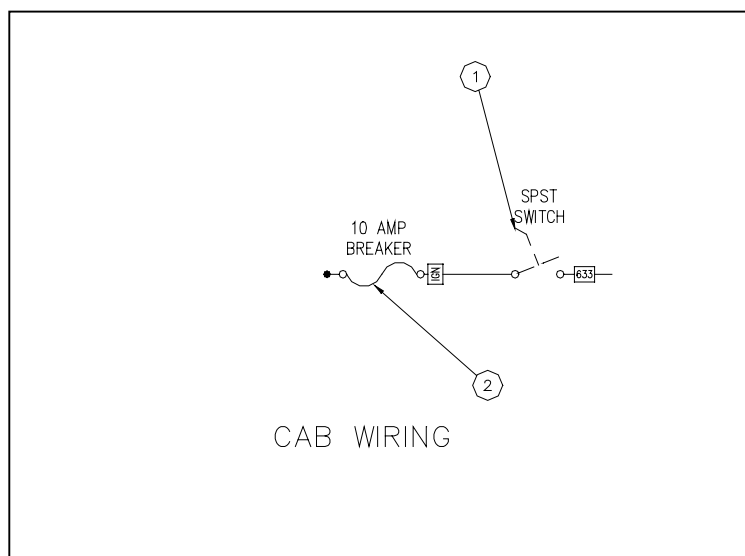
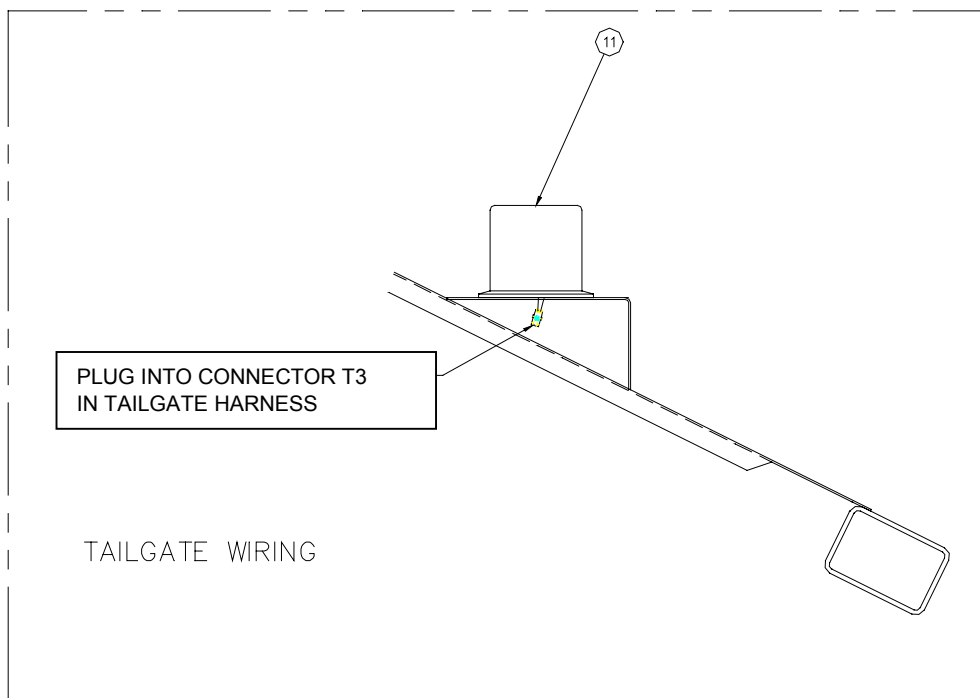
MUNICIPAL LIGHT KIT 372-2409



**MUNICIPAL LIGHT KIT
372-2409**

REF	PART NO.	DESCRIPTION	REQ'D
1	108-4867-005	BREAKER, circuit – 10 amp	1
2	108-1814	SWITCH, toggle	1
3	311-2270	BOX, light	2
5	115-1029	LIGHT, 7" amber flashing	2
	115-1029-001	LIGHT	1
	115-0742-003	PIGTAIL	1
6	108-7487	FLASHER	1
7	115-0743	LIGHT, back-up	1
	115-0743-001	LIGHT	1
	115-0742-002	GROMMET	1
	115-0743-003	PIGTAIL	1
8	FS410315	SCREW, machine - #8 – 32 x 3/4"	2
9	FS280300	NUT, hex - #8 - 32	2
10	115-1262	LIGHT, flood	1
	115-1282-001	BULB	1
11	035-3354	GUARD, light	1

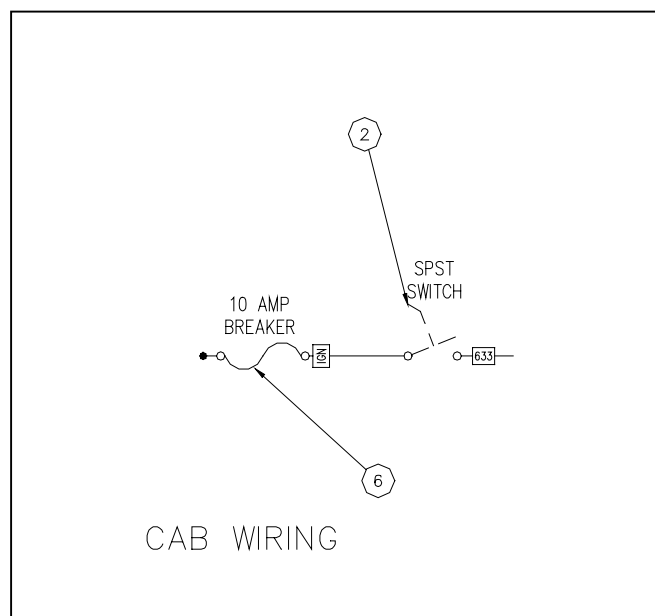
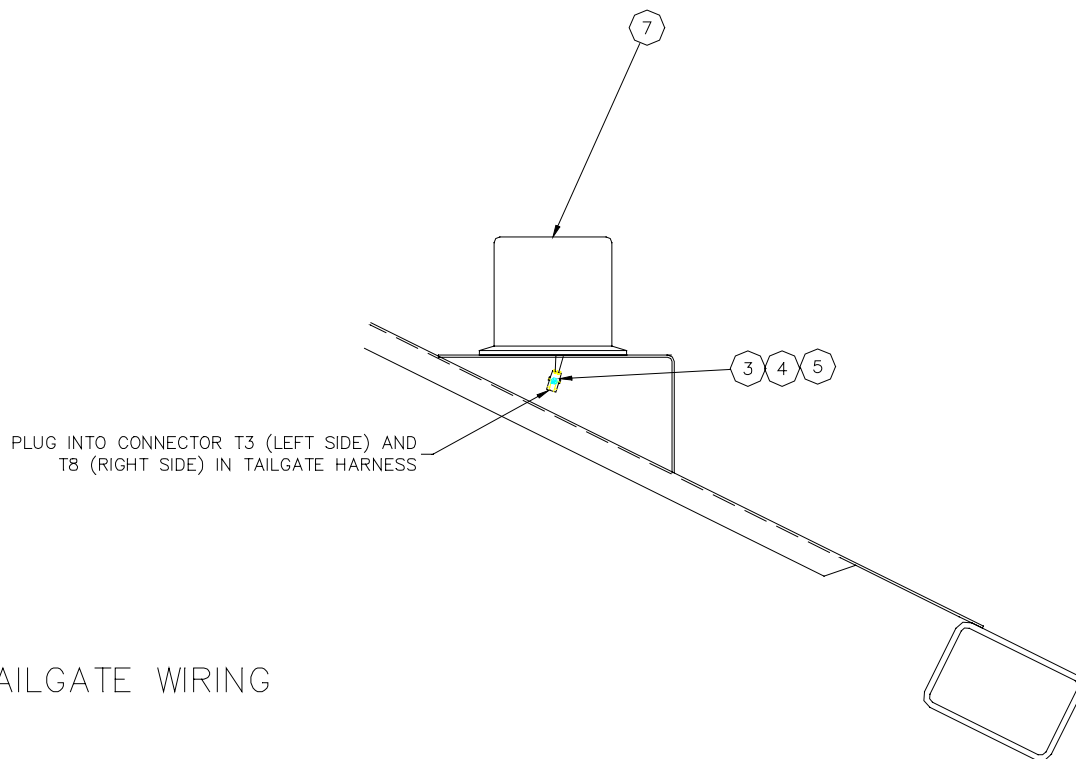
SINGLE STROBE LIGHT KIT 372-2092-001



**SINGLE STROBE LIGHT KIT
372-2092-001**

REF	PART NO.	DESCRIPTION	REQ'D
1	108-1814	SWITCH, toggle	1
2	108-4867-005	BREAKER, circuit – 10 amp	1
3	108-4827-003	CONNECTOR, 2-way male	1
4	108-4827-111	TERMINAL, male	2
5	108-4827-132	SEAL, cable	2
6	108-0952	GROMMET	1
11	115-1232	LIGHT, strobe – amber - with brush guard	1
	115-1232-001	LIGHT	1
	115-1232-002	GUARD, light	1
	FS240411	SCREW - #10 – 32 x 1" (light mounting)	3
	FS270440	NUT, hex - #10 – 32	3

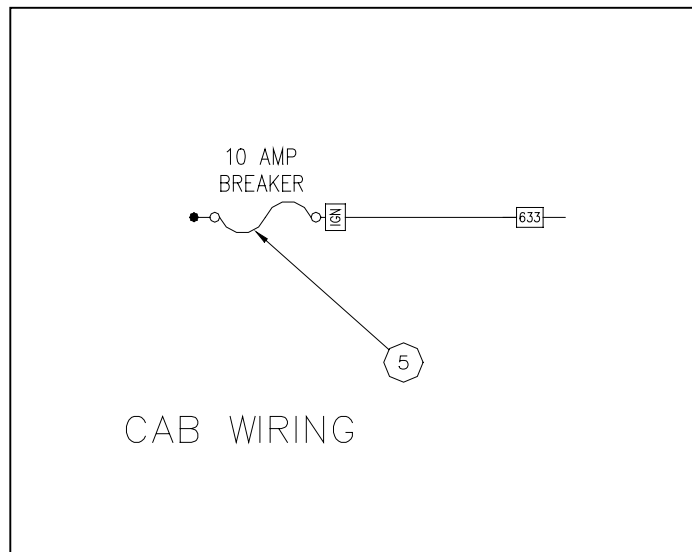
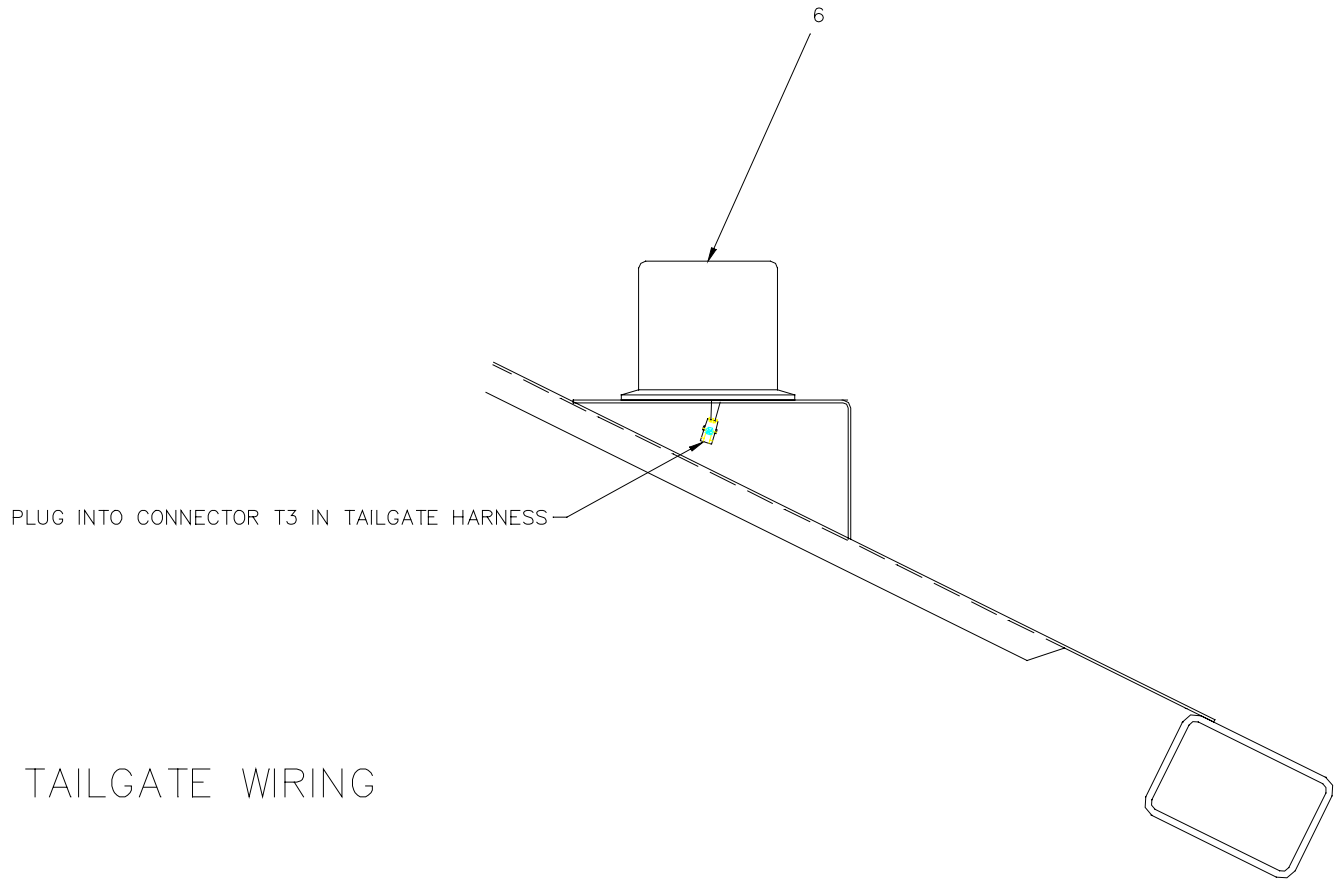
DUAL STROBE LIGHT KIT 372-2092-002



**DUAL STROBE LIGHT KIT
372-2092-002**

REF	PART NO.	DESCRIPTION	REQ'D
1	108-0952	GROMMET	1
2	108-1814	SWITCH, toggle	1
3	108-4827-003	CONNECTOR, 2-way male	2
4	108-4827-111	TERMINAL, male	4
5	108-4827-132	SEAL, cable	4
6	108-4867-005	BREAKER, circuit – 10 amp	1
7	115-1232	LIGHT, strobe – amber - with brush guard	1
	115-1232-001	LIGHT	1
	115-1232-002	GUARD, light	1
	FS240411	SCREW - #10 – 32 x 1" (light mounting)	3
	FS270440	NUT, hex - #10 – 32	3

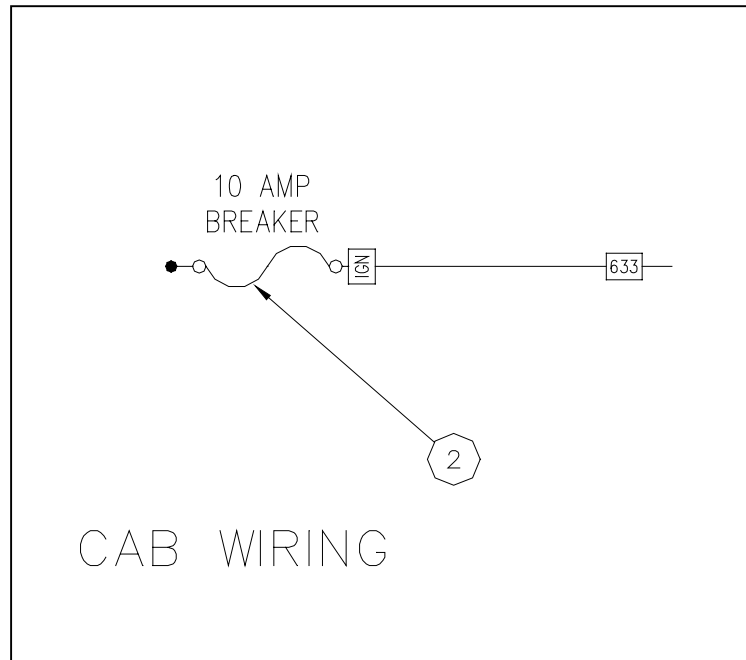
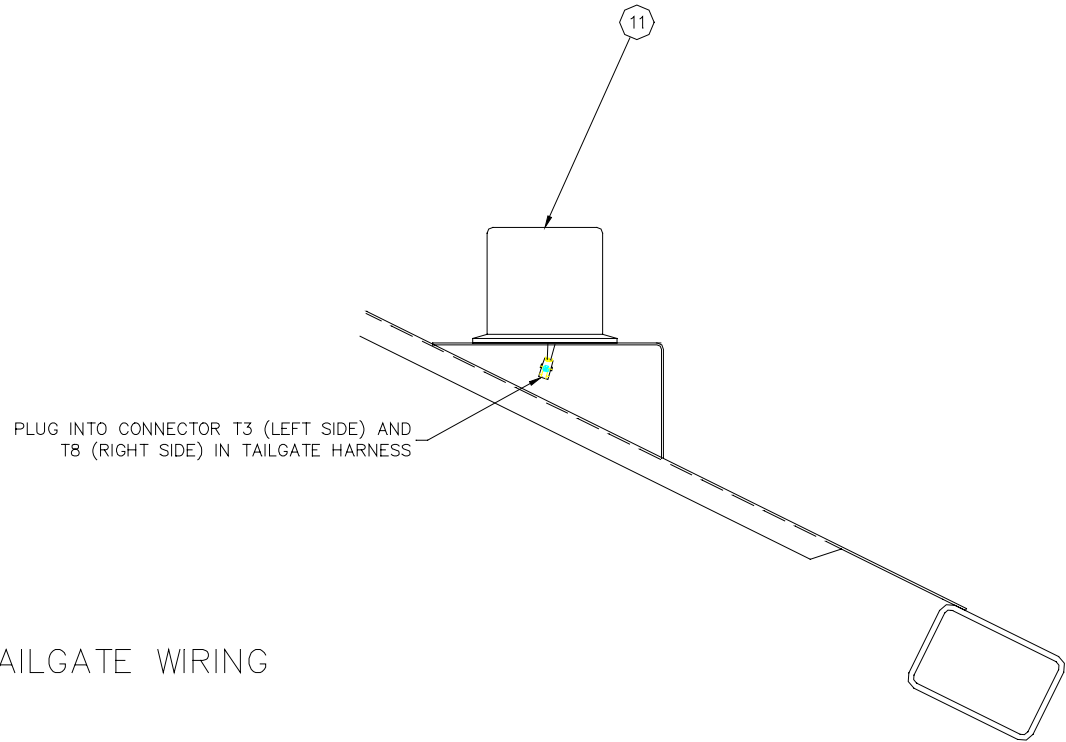
SINGLE STROBE KIT (IGN Power) **372-2092-011**



**SINGLE STROBE KIT (IGN Power)
372-2092-011**

REF	PART NO.	DESCRIPTION	REQ'D
1	108-0952	GROMMET	1
2	108-4827-003	CONNECTOR, 2-way male	1
3	108-4827-111	TERMINAL, male	2
4	108-4827-132	SEAL, cable	2
5	108-4867-005	BREAKER, circuit – 10 amp	1
6	115-1232	LIGHT, strobe – amber - with brush guard	1
	115-1232-001	LIGHT	1
	115-1232-002	GUARD, light	1
	FS240411	SCREW - #10 – 32 x 1" (light mounting)	3
	FS270440	NUT, hex - #10 – 32	3

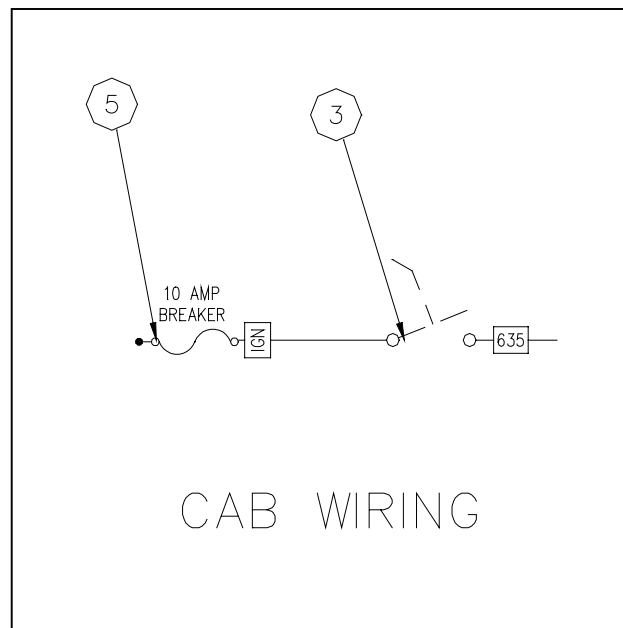
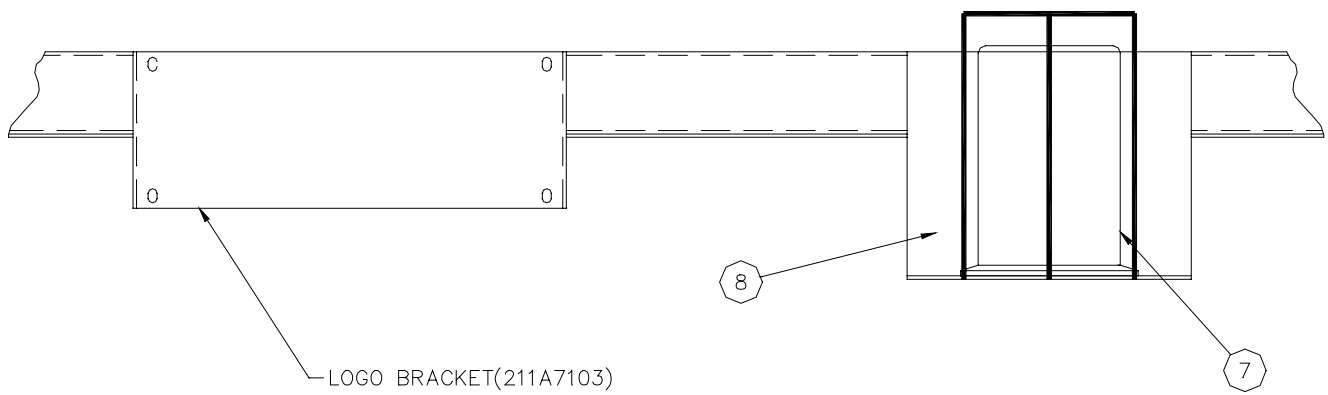
DUAL STROBE LIGHT KIT (IGN POWER) **372-2092-012**



**DUAL STROBE LIGHT KIT (IGN POWER)
372-2092-012**

REF	PART NO.	DESCRIPTION	REQ'D
2	108-4867-005	BREAKER, circuit – 10 amp	1
3	108-4827-003	CONNECTOR, 2-way male	2
4	108-4827-111	TERMINAL, male	4
5	108-4827-132	SEAL, cable	4
6	108-0952	GROMMET	2
11	115-1232	LIGHT, strobe – amber - with brush guard	2
	115-1232-001	LIGHT	1
	115-1232-002	GUARD, light	1
	FS240411	SCREW - #10 – 32 x 1" (light mounting)	6
	FS270440	NUT, hex - #10 – 32	6

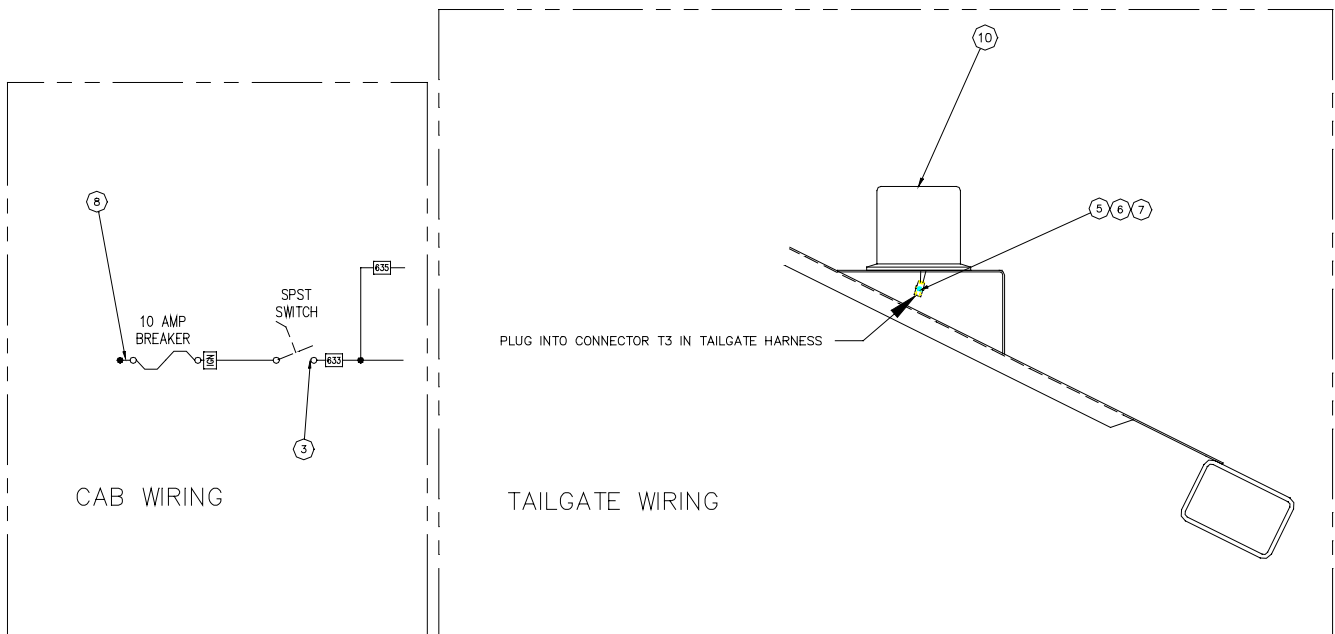
LEFT FRONT STROBE KIT
372-2092-100



**LEFT FRONT STROBE KIT
372-2092-100**

REF	PART NO.	DESCRIPTION	REQ'D
1	054-7350-002	TUBE, shrink	3
2	108-0952	GROMMET	1
3	108-1814	SWITCH, toggle	1
4	108-4330	CONNECTOR, wire	3
5	108-4867-005	BREAKER, circuit – 10 amp	1
6	108-6461-011	PLUG	1
7	115-1232	LIGHT, strobe – amber – with brush guard	1
	115-1232-001	LIGHT	1
	115-1232-002	GUARD, light	1
	FS240411	SCREW - #10 – 32 x 1" (light mounting)	3
	FS270440	NUT, hex - #10 – 32	3

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**STROBE LIGHT KIT (FRONT LEFT & REAR LEFT)
372-2092-200**

REF	PART NO.	DESCRIPTION	REQ'D
1	1	054-7350-002 TUBE, shrink	3
	2	108-0952 GROMMET	2
	3	108-1814 SWITCH, toggle	1
	4	108-4330 CONNECTOR, wire	1
	5	108-4827-003 CONNECTOR, 2-way male	1
	6	108-4827-111 TERMINAL, male	2
	7	108-4827-132 SEAL, cable	2
	8	108-4867-005 BREAKER, circuit – 10 amp	1
	9	108-6461-012 PLUG	1
	10	115-1232 LIGHT, strobe – amber - with brush guard	2
		115-1232-001 LIGHT	1
		115-1232-002 GUARD, light	1
	11	FS240411 SCREW - #10 – 32 x 1" (light mounting)	6
	12	FS270440 NUT, hex - #10 – 32	6
	13	311-4344 BRACKET, strobe – front	1

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SECTION 3 – PUMPS.....	MR-74897-608
SECTION 4 – CONTROLS (includes electrical)	MR-75018-404
SECTION 5 – BODY	MR-75019-404
SECTION 6 – TAILGATE	MR-75020-404

SECTION 1

GENERAL INFORMATION



A  COMPANY

SECTION 1 – TABLE OF CONTENTS

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Pump Flanges 1.13

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SAFETY SYMBOLS and DEFINITIONS

Listed below are the definitions for the various levels of safety hazards. It is important that the operator's of this equipment read and understand safety messages as they relate to this equipment operation.

1. **DANGER** – indicates an imminently hazardous situation, which if not avoided WILL result in DEATH or SERIOUS INJURY if you don't follow proper instructions.
2. **WARNING** – indicates an imminently hazardous situation, which if not avoided COULD result in DEATH OR SERIOUS INJURY if you don't follow proper instructions.
3. **CAUTION** – indicates an imminently hazardous situation, which if not avoided MAY result in MINOR to MODERATE INJURY if you don't follow proper instructions.
4. **NOTICE** – means unit or other property may be damaged if these instructions are not followed.

LOCK-OUT/TAG OUT PROCEDURES

Before servicing and/or working on any component of this unit, safety requirements need to be considered to determine the minimum requirements for lockout/tagout of energy sources.

Energy sources include hydraulic, pneumatic and kinetic.

BE SURE ALL PERSONS ARE CLEAR OF THE AREA WHEN PLACING UNIT IN LOCKOUT.

The lockout procedure is as follows:

1. If unit is operating, shut it down through the normal stopping method.
2. Set the parking brake, making sure the brakes are holding and working properly. Chock all the wheels.
3. Shut down all power sources. Turn engine off and remove the key from the ignition, putting it in your pocket.

Turn off any auxiliary engines and disengage the power take-off system, if necessary.

4. Install LOCKOUT tag on the steering wheel.
5. Move the operating control levers and switches through a full stroke to bleed any hydraulic pressure.
6. If needed, set body and tailgate props in position.

SAFETY MESSAGES



Safety must always be given first consideration. Look for the Safety Alert Symbol. This symbol alerts you that personal injury or property damage is a possibility unless specified precautions are taken.

IMPORTANT SAFETY NOTICE

Proper maintenance and service are important to the safe, reliable operation of the Heil Co.'s products. Service procedures recommended by Heil are described in this service manual and are effective for performing service operations. Some of these service operations may require the use of tools or blocking devices specially designed for the purpose. Special tools should be used when and as recommended. It is important to note that some warnings against the use of specific methods that can damage the product or render it unsafe are stated in the service manual. It is also important to understand these warnings are not exhaustive. Heil could not possibly know, evaluate and advise the service trade of all conceivable ways in which service might be done or of the possible hazardous consequences of each way. Consequently, Heil has not undertaken any such broad evaluations. Accordingly, anyone who uses service procedures or tools which are not recommended by Heil must first satisfy himself that neither his safety nor the product safety will be jeopardized by the method he selects.



WARNING



If incorrectly used this equipment can cause severe injury. Those who use and maintain the equipment should be trained in its proper use, warned of its dangers, and should read entire manual before attempting to set up, operate, adjust or service the equipment. Keep this manual for future reference.



MAINTENANCE



Do not service this machine until you have read and understood this manual.



LOCKOUT PROCEDURE



During repairs to the tailgate, packing mechanism, or hydraulic drive system, a lockout procedure should be employed whereby the power shall be shut off, the ignition key removed, and a sign be placed on the steering wheel warning against any attempt to start the unit.



OPERATION



Do not operate this machine until you have read and understood the operator's manual supplied with this equipment. When operating, be certain that all individuals are clear and be ready to stop and/or reverse the operation at any point.

**MODIFICATION OR RECONSTRUCTION**

It is the responsibility of any person reconstructing or modifying this equipment to do so in accordance with the appropriate sections of the ANSI Z245. 1 safety standard and to furnish instructions and safety precautions associated with the reconstruction or modification of the unit.

CAUTION**CAUTION**

Disengage PTO, or "Pump Switch" when Refuse Unit is not in use, being repaired or worked upon or when traveling for longer than 2 minutes.

CAUTION

In all cases, when unit is stored or not in use, all cylinders must be in the collapsed position, the PTO disengaged or pump switch is "OFF". Key should be removed from ignition to prevent tampering by unauthorized persons.

CAUTION

Wear the proper safety equipment. Obtain additional safety equipment when your safety is in doubt. Hard hats, safety shoes, protective eye wear, reflective clothing and gloves may be required. Inquire from the owner/operator on any additional safety equipment.

CAUTION

Whenever you are working on or about hydraulic lines or components, wear proper eye protection and avoid contact with oil if possible. Never check for oil leaks with your hands.

**WARNING****WARNING**

Do not operate or service this machine until you have been fully trained and have read and understood the entire operation and maintenance manual supplied with this equipment. Manuals may be obtained from a Heil distributor.

DANGER**DANGER**

Operating this unit under the influence of alcohol or drugs could result in personal injury or death!

**DANGER**

DO NOT enter under the chassis unless the unit is in LOCK-OUT. To place unit in LOCK-OUT, stop the engine, set the brakes and make sure the brakes are holding and working properly, chock all wheels, remove the keys from the cab and insert a LOCK-OUT tag on the steering wheel.

**DANGER**

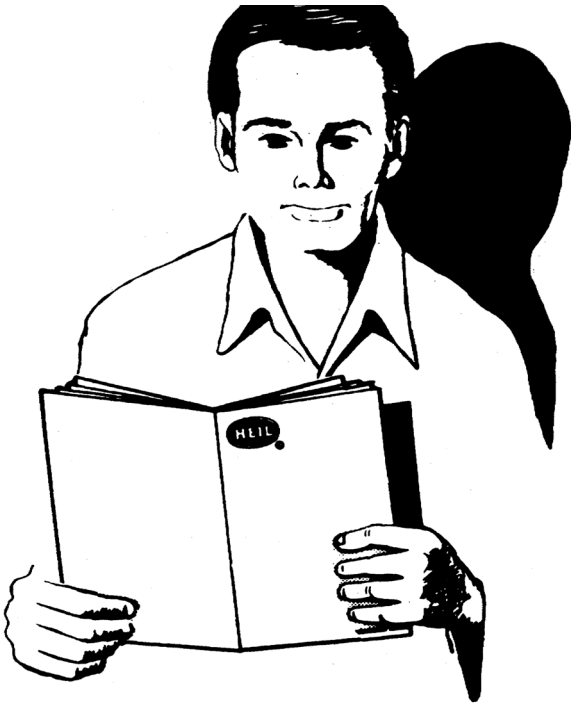
Visually check the machine and run it through several cycles to find leaks, broken, missing or malfunctioning parts. If such deficient condition exists, immediately stop work on the machine and advise the appropriate person. A part failure during operating can cause damage to the unit, injury or death.

**DANGER**

Stand clear when tailgate is in motion and during unloading cycle. Do not stand under or cross under raised tailgate. Failure to do so may result in injury or death.

**DANGER**

Before entering the body area, place the unit in LOCK-OUT. To place unit in LOCK-OUT, stop the engine, set the brakes and make sure the brakes are holding and working properly, chock all wheels, remove the keys from the cab and insert a LOCK-OUT tag onto steering wheel.



IMPORTANT!

- Before starting any maintenance, study this section of the manual.
- Read all safety messages and decals on the unit.
- Clear area of other persons before performing any maintenance.
- Know and understand safe use of all controls.
- It is your responsibility to understand and follow manufacturer's instructions on equipment and care.

SAFETY DECALS ON THE UNIT

Make sure you can read all safety and instruction decals. Clean decals if you cannot read the words.

When cleaning the decals, use only a cloth, water and soap. Do not use solvent, gasoline, etc.

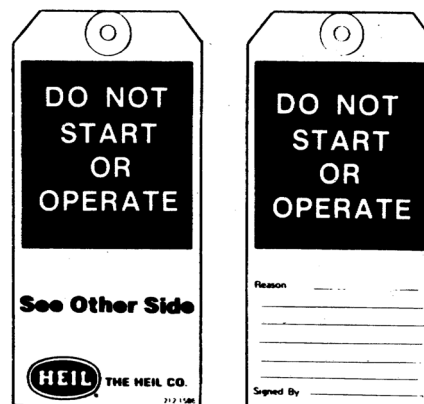
Decals **must** be replaced if (1) the decal is damaged,

(2) the decal is missing or (3) the decal cannot be read.

If a decal is on a part that is replaced, make sure a new decal is installed on the new part. See back of manual for decal kit and sheets. Order decal sheet from your Heil Distributor.

DO NOT OPERATE TAG

When servicing the unit, hang a Do Not Operate tag on the steering wheel. A Do Not Operate tag, Heil part number 212-1586 is included with each new unit. Extra tags can be ordered through your Heil distributor.



INTRODUCTION

The following sections are a guide for maintenance and adjustment of the HEIL unit. It covers preventive maintenance, adjustment and trouble shooting hints.

In order to diagnose a problem quickly and effectively, a good service person must be thoroughly familiar with the machine. This section explains the system and major components to give that knowledge. Diagrams and schematics of the electrical and hydraulic systems are at the back of this section.

SERVICE/PARTS ASSISTANCE

Assistance in troubleshooting repair and service of this equipment can be obtained by contacting the authorized HEIL distributor in your area. HEIL personnel are trained to give prompt, professional assistance.

ALWAYS give the machine model and serial number in all correspondence relating to this equipment.

LUBRICATION INFORMATION

Before performing maintenance, check the job carefully to find all the hazards present and make sure all necessary safeguards or safety devices are used to protect all persons and equipment involved.

HYDRAULIC OIL SPECIFICATIONS

HEIL hydraulic oil (Pennzoil Pennzbell AWX MV32) contains the following specifications.

Gravity, °API (ASTM D-287) 31.0
 Specific Gravity @ 60°F(15.6°C) (ASTM D-287)
 0.8780
 Flash Point (ASTM D-92) 410°F
 Pour Point (ASTM D-97) -60°F
 Viscosity
 @100°F, SUS (ASTM D-445 & ASTM D-2161) 153
 @210°F, SUS (ASTM D-445 & ASTM D-2161) 47.3
 Viscosity Index (ASTM D2270) 155
 Rust Protection (ASTM D-665 A & B) Pass
 Foam Test (ASTM D-892) Pass
 Four-Ball Wear Test (ASTM D-4172)
 (40 kg, 1800RPM, 130°F, 1 hr) 0.66
 Zinc % wt. (XRF) .04

NOTE: Cold weather operation requires special oil considerations. Viscosity should not exceed 7500 SSU at lowest startup temperature. Continuous operation should range between 40-1000 SSU for all temperature ranges.

The following oils by brand name are approved for use in the hydraulic system on this equipment and considered to be all temperature hydraulic fluids.

Pennzoil Pennzbell AWX MV32
 Mobil DTE 13M
 Shell Tellus T 32
 Texaco Rando HDZ 32

Oil Can Lubricant Recommendation: Non-detergent SAE 20 engine oil must be used to lubricate all moveable mechanical parts not furnished with grease fittings. Apply sufficient oil to give good lubrication, but do not bathe parts in oil. Always wipe off excess.

Grease Lubricant Recommendation: Use No. 1 pressure gun grease. Before engaging grease gun, clean the fitting. Always pump enough grease to purge the joint of contaminated grease and wipe off the excess.

Winch Gear Oil – Use AGMA Grade 5 EP (90 wt.) for 8,000 lb. Winch and AGMA Grade 7 EP (140 wt.) for 12,000 lb. Winch. Brand names or functional equivalent are Texaco Meropa 220 and Texaco Meropa 460.



**PARTS ORDERING
&
INQUIRIES**

**Contact your
Local HEIL
Distributor or
Service Center**

**TECHNICAL
SUPPORT
&
WARRANTY
CLAIMS**

1-800-251-7258

WEBSITE : www.heil.com

Standard Torque Data for Nuts and Bolts

Recommended torque, in foot pounds, for all Standard Application Nuts and Bolts, provided:

- A. All thread surfaces are clean and lubricated with SAE-30 engine oil. (See NOTE.)
- B. Joints are rigid, that is, no gaskets or compressible materials are used.
- C. When reusing nuts or bolts use minimum torque values.







NOTE: Multiply the standard torque by:

- .65 when finished jam nuts are used.
- .70 when Molykote, white lead or similar mixtures are used as lubricants.
- .75 when parkerized bolts or nuts are used.
- .85 when cadmium plated bolts or nuts and zinc bolts w/waxed zinc nuts are used.
- .90 when hardened surfaces are used under the nut or bolt head.

Bolt or Stud Diameter	Type 1 Studs Only		Type 1 Bolts 6" length or less		Type 1 Bolts longer than 6"		Type 5 (all lengths)		Type 8 (all lengths)			
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Only when used* in cast (gray) iron		All other applications	
1/4	5	6	5	6	3	3	9	10	11	13	12	14
5/16	12	13	12	13	6	7	19	21	24	27	27	30
3/8	21	24	21	24	11	13	33	37	43	47	45	50
7/16	35	38	35	38	19	21	53	60	69	76	75	85
1/2	52	58	52	58	29	32	80	90	104	117	115	130
9/16	70	80	70	80	41	46	115	130	150	170	165	185
5/8	98	110	98	110	57	63	160	180	210	230	220	250
3/4	174	195	174	195	100	112	290	320	350	390	400	450
7/8	300	330	162	181	162	181	420	470	570	630	650	730
1	420	470	250	270	250	270	630	710	850	950	970	1090
1 1/8	600	660	350	380	350	380	850	950	1200	1350	1380	1550
1 1/4	840	940	490	540	490	540	1200	1350	1700	1900	1940	2180
1 3/8	1100	1230	640	710	640	710	1570	1760	2300	2500	2600	2800
1 1/2	1470	1640	850	940	850	940	2000	2300	3000	3300	3300	3700
1 3/4	2350	2450	1330	1490	1330	1490	3300	3700	4700	5200	5300	6000
2	3500	3900	2000	2200	2000	2200	5000	5500	7000	7800	8000	9000

* When bolt penetration is 1 1/2 times the diameter of the bolt.

BOLT TYPE IDENTIFICATION CHART

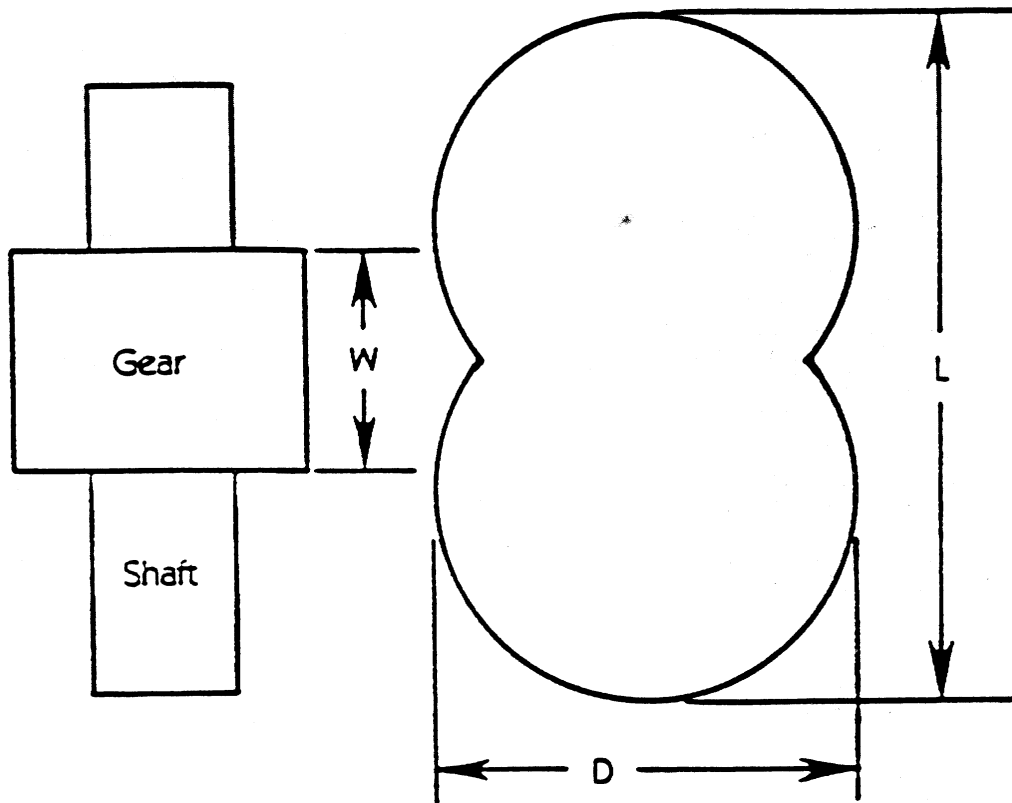
IH TYPE	S.A.E. GRADE	DESCRIPTION	BOLT HEAD MARKING**
1	EQUIVALENT 1 or 2	WILL HAVE A  STANDARD MONOGRAM IN THE CENTER OF THE HEAD Low or Medium Carbon Steel Not Heat Treated	
5	5	WILL HAVE A  AND 3 RADIAL LINES Quenched and Tempered Medium Carbon Steel	
8	8	WILL HAVE A  AND 6 RADIAL LINES Quenched and Tempered Special Carbon or Alloy Steel	

** The center marking identifies the bolt manufacturer. The  monogram is currently used. Some bolts may still have an IH or a raised dot which previously identified IH bolts.

DIAMETERS and CORRESPONDING CROSS-SECTIONAL AREAS

1"	.79		3 3/8"	8.95		5 3/4"	25.96		8 1/8"	51.85
1 1/8"	.99		3 1/2"	9.62		5 7/8"	27.11		8 1/4"	53.50
1 1/4"	1.22		3 5/8"	10.32		6"	28.27		8 3/8"	55.09
1 3/8"	1.49		3 3/4"	11.04		6 1/8"	29.47		8 1/2"	56.74
1 1/2"	1.76		3 7/8"	11.79		6 1/4"	30.70		8 5/8"	58.43
1 5/8"	2.07		4"	12.56		6 3/8"	31.92		8 3/4"	60.00
1 3/4"	2.40		4 1/8"	13.36		6 1/2"	33.18		8 7/8"	61.86
1 7/8"	2.76		4 1/4"	14.18		6 5/8"	34.47		9"	63.61
2"	3.14		4 3/8"	15.03		6 3/4"	35.80		9 1/8"	65.40
2 1/8"	3.55		4 1/2"	15.90		6 7/8"	37.12		9 1/4"	67.20
2 1/4"	3.97		4 5/8"	16.80		7"	38.48		9 3/8"	69.03
2 3/8"	4.43		4 3/4"	17.72		7 1/8"	39.87		9 1/2"	71.00
2 1/2"	4.90		4 7/8"	18.67		7 1/4"	41.30		9 5/8"	72.76
2 5/8"	5.41		5"	19.63		7 3/8"	42.72		9 3/4"	74.50
2 3/4"	5.93		5 1/8"	20.63		7 1/2"	44.17		9 7/8"	76.59
2 7/8"	6.49		5 1/4"	21.64		7 5/8"	45.66		10"	78.54
3"	7.06		5 3/8"	22.69		7 3/4"	47.20		10 1/8"	80.51
3 1/8"	7.67		5 1/2"	23.75		7 7/8"	48.71		10 1/4"	82.51
3 1/4"	8.25		5 5/8"	24.85		8"	50.26		10 3/8"	84.54
									10 1/2"	86.59

**SIZING A GEAR PUMP
(based on existing pump)**



Necessary Measurements:

1. Measure gear width (W)
2. Measure bore diameter (D)
3. Measure distance across bore chamber (L)

Formulas for finding Gear Pump GPM:

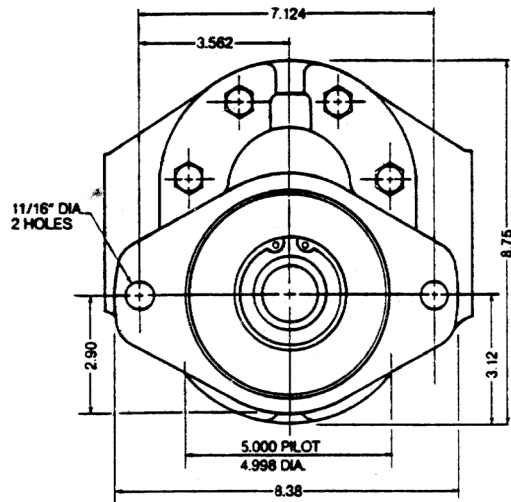
$$\text{GPM @ 1000 RPM} = 26 \times W \times (2D - L) \times \frac{L - D}{2}$$

$$\text{GPM @ 1200 RPM} = 31 \times W \times (2D - L) \times \frac{L - D}{2}$$

$$\text{GPM @ 1800 RPM} = 47 \times W \times (2D - L) \times \frac{L - D}{2}$$

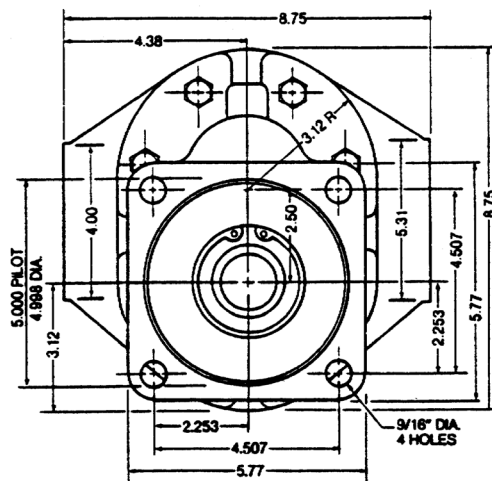
PUMP FLANGES

2 Bolt Flange:



<u>SAE Code</u>	<u>Bolt Centers</u>	<u>Bolt Hole Dia.</u>	<u>Pilot Diameter</u>
A	4 3/16"	7/16"	3 1/4"
B	5 3/4"	9/16"	4"
C	7 1/8"	11/16"	5"
D	9"	13/16"	6"

4 Bolt Flange:



<u>SAE Code</u>	<u>Bolt Centers</u>	<u>Bolt Hole Dia.</u>	<u>Pilot Diameter</u>
B	5"	9/16"	4"
C	6 3/8"	11/16"	5"
D	9"	13/16"	6"

AVERAGE DENSITY OF MATERIALS **LB. PER CU. FT.**

MISCELLANEOUS

Water, 4° C	62.4
Water, 100° C	59.8
Paper	58
Glass, common	162
Petroleum	45-54
Coal, Anthracite	47-58
Coal, Coke	23-32

WOOD

Cedar	22
Fir, Douglas	32
Oak	42-54
Pine, Oregon	32
Pine, Southern	38-42
Redwood	26
Spruce	28
Black Walnut	37

MASONARY

Ashlar Masonry*	143-162
Rubble Masonry*	137-156
Dry Rubble Masonry*	110-130
*Granite, Syenite, Gneiss, Marble, Limestone, Sandstone, Bluestone	
Brick Masonry	103-128
Concrete Masonry	100-144
Portland Cement	196
Portland Cement, Loose	94
Lime, Gypsum, Loose	53-64
Mortar, Lime, set	103

EARTH

Clay, dry	63
Clay, damp, plastic	110
Clay & Gravel, dry	100
Earth, dry loose	76
Earth, dry packed	95
Earth, moist loose	78
Earth, moist packed	96
Earth, mud lowing	108
Earth, mud packed	115
Riprap, Limestone, Sandstone, Shale	80-105
Sand, gravel, dry loose	90-105
Sand, gravel, dry packed	100-120
Sand, gravel, wet	126

EXCAVATIONS IN WATER

Sand or Gravel	60
Sand or Gravel & Clay	65
Clay	80
River Mud	90
Soil	70
Stone Riprap	65

STONE, QUARRIED, PILED

Basalt, Granite, Gneiss	96
Limestone, Marble, Quartz	95
Sandstone	82
Shale	92
Greenstone, Hornblend	107

METALS, ALLOYS, ORES

Aluminum, cast-hammered	165
Brass, cast-rolled	534
Bronze	509
Copper, cast-rolled	556
Gold, cast-hammered	1205
Iron, gray-cast	442
Iron Slag	172
Lead	710
Manganese	475
Mercury	847
Nickel	537
Steel	481-489
Tin, cast-hammered	459
Tungsten	1200
Zinc, cast-rolled	440

**NOTE: TO CONVERT TO CU. YDS. MULTIPLY
AMOUNT LISTED TIMES 27.**

U.S. WEIGHTS & MEASURES (EQUALS)

4 gills	1 pint
2 pints	1 quart
4 quarts	1 gallon
7.48 gallons.....	1 cu. ft.
240 gals. of water	1 ton
340 gals. of gasoline.....	1 ton

MEASURES OF WEIGHTS (EQUALS)

16 ounces	1 pound
2000 pounds	1 short ton
2240 pounds	1 long ton
100 cu. ft.	1 register ton
40 cu. ft.	1 U.S. shipping ton

CIRCULAR MEASURE (EQUALS)

60 seconds.....	1 minute
60 minutes	1 degree
90 degrees	1 quadrant
360 degrees	circumference

METRIC EQUIVALENTS (EQUALS)

1 litre.....	.0353 cu. ft.
1 litre.....	.2642 gallon
1 litre.....	61.023 cu. in.
1 litre.....	2.202 lbs. of water (62° F)
1 cu. ft.....	28.32 litres
1 gallon.....	3.785 litres
1 cu. inch0164 litre

MEASURES OF WEIGHTS (EQUALS)

1 gram0353 ounce
1 kilogram.....	.2.205 lbs.
1 ounce.....	28.35 grams
1 pound454 kilogram
1 ton.....	.907 metric ton

ELECTRICAL UNITS (EQUALS)

1 kilowatt	1.34 h.p.
1 horsepower.....	746 watts

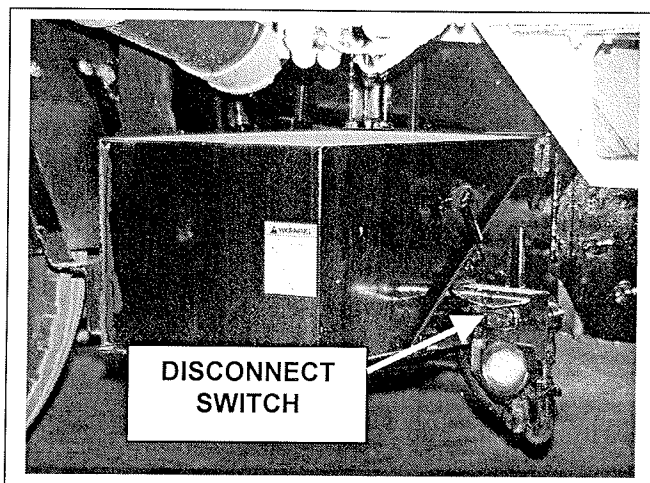
COLD WEATHER WARM UP PROCEDURE

When air temperatures are cold, it may be necessary to warm up the unit hydraulic oil, before going on daily route operation. Follow these steps.

1. Turn on truck and let the engine idle.
2. Set the unit parking brake and make sure it is holding.
3. Engage the hydraulic pump for approximately 5 minutes.
4. **Be sure area around unit is clear of all people and objects, before actuating controls.**
5. Operate the unit functions (lift and body) through 10 cycles to warm up oil.
6. Unit is now ready to go on route.

The battery disconnect switch must be turned off whenever the vehicle is not in service and/or to be left unattended.

Battery cables must be securely anchored and not rubbing other equipment. Cable insulation must be free of damage and abrasion. Inspect the cable weekly.



WARNING

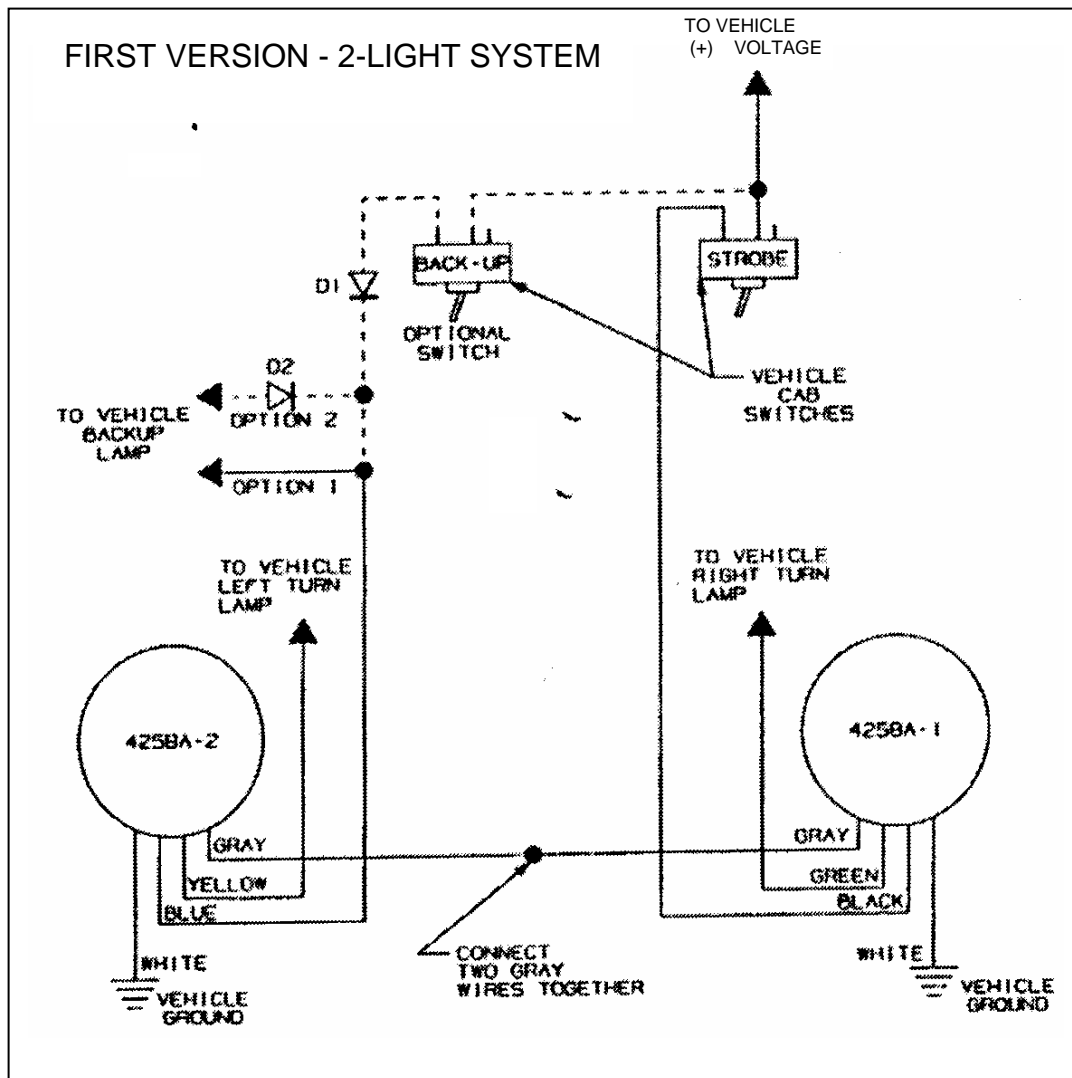
**THE BATTERY DISCONNECT SWITCH
MUST BE TURNED OFF WHENEVER THE
VEHICLE IS NOT IN SERVICE AND/OR TO
BE LEFT UNATTENDED!**

**Battery Cables must be be securely
anchored and not rubbing other
equipment. Cable insulation must be free
of damage and abrasion.
Inspect weekly.**

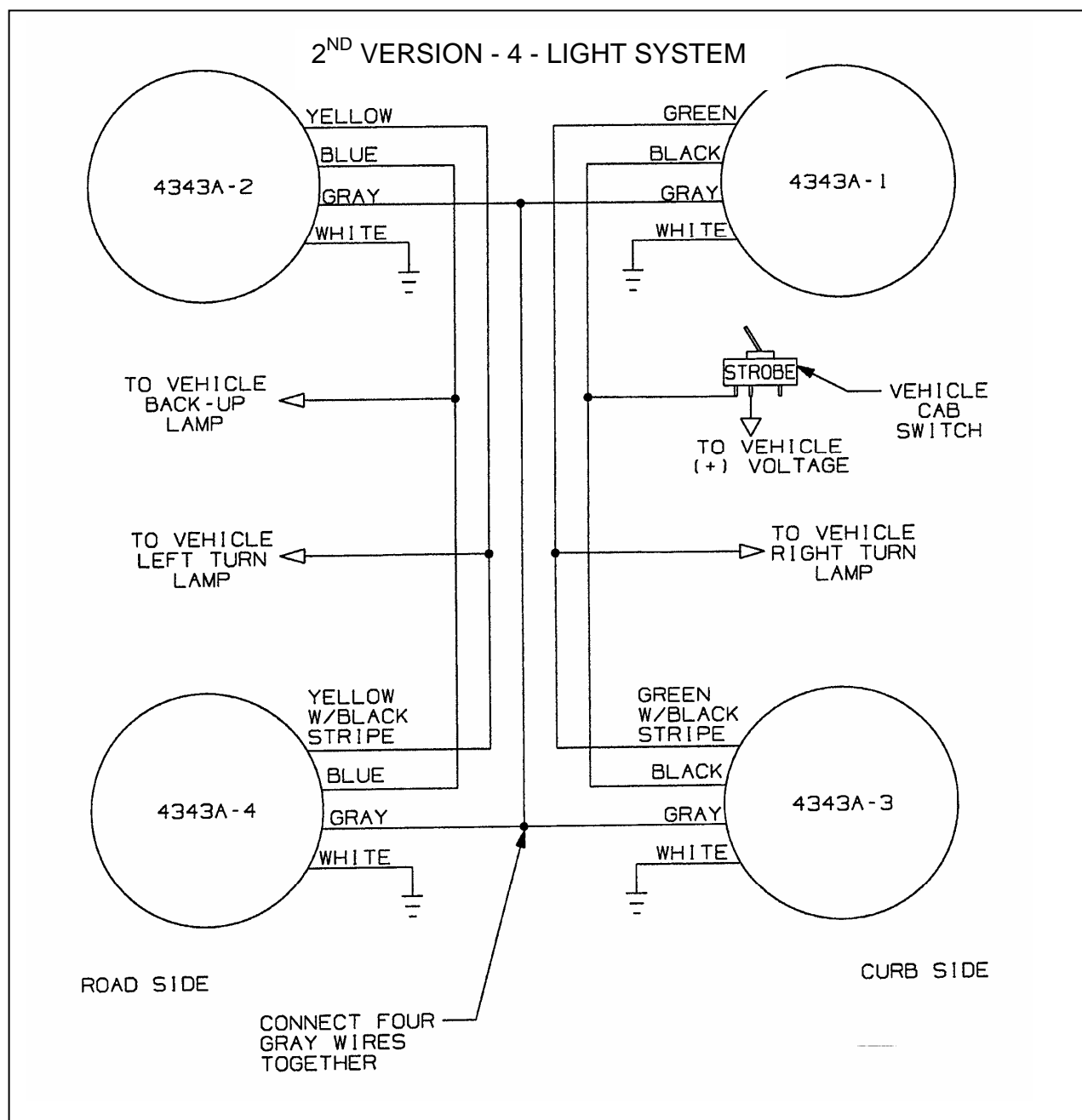
Peterson Smart Lamp Light Systems

Heil has used two different versions of the Peterson Smart Lamp Systems in the past years. Both of the Peterson Smart Lamp lighting systems use LED lights that function as strobe lights and turn signals. The strobe function can be manually activated with a switch in the cab or configured to strobe automatically when the vehicle is shifted into reverse. Activating a turn signal automatically overrides the strobe function and now the strobe light functions as a turn signal light. For Peterson Lights Customer Service call 800-821-3490.

1st Version – The first version consisted of a two light system containing one master light and one slave light. Both of these lights have a different part number and can not be replaced or mixed with a different brand light. Some vehicles used two of these two light systems combined together to obtain a total of four lights on the rear of the body. When used in this set up both systems together allow for four strobe lights but only two of the lights are synchronized together.



2nd Version – The second version is a four light system containing one master light and three slave lights. All of these lights have a different part number and can not be replaced or mixed with a different brand light. This system provides for a total of four strobe lights that are all synchronized to strobe in the same pattern sequence.



SECTION 3

HYDRAULIC PUMPS SERVICE MANUAL

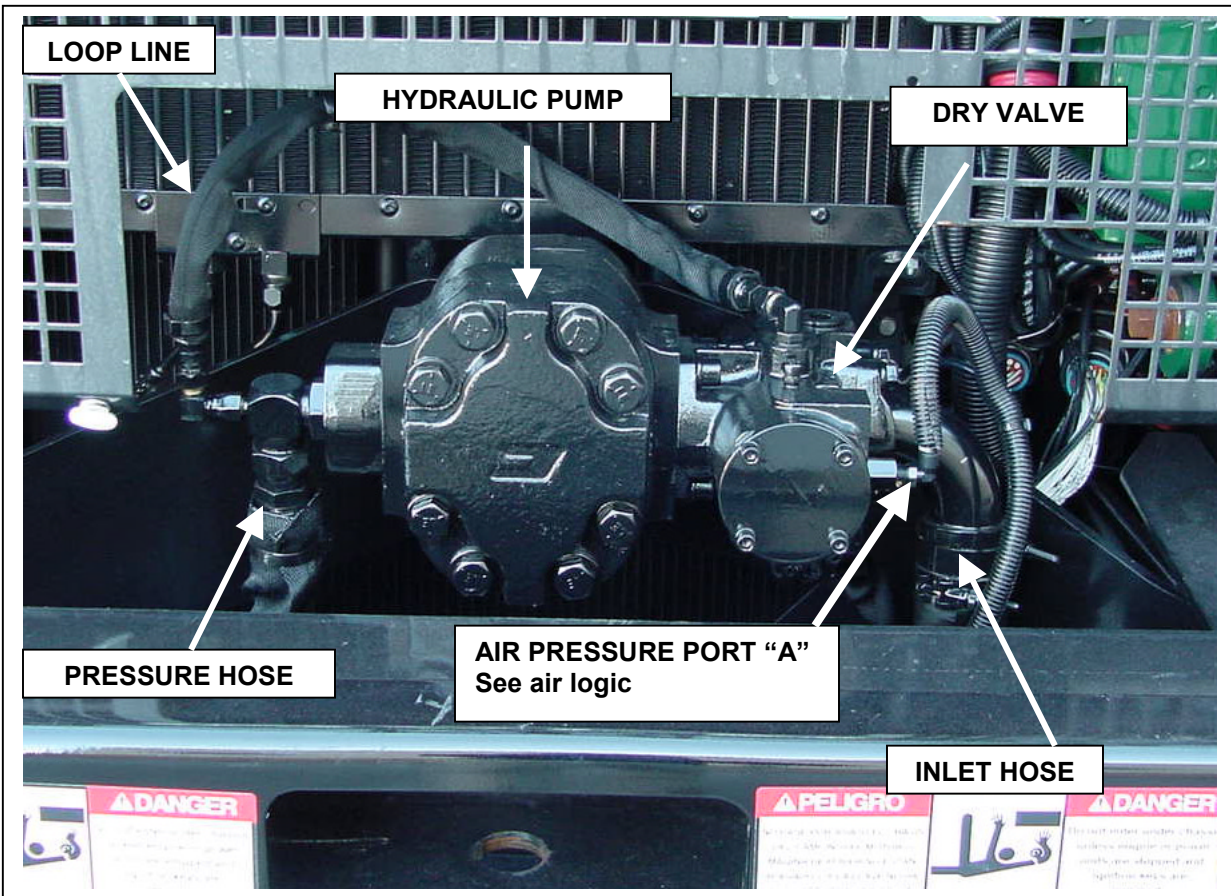


A  **DOVER** COMPANY

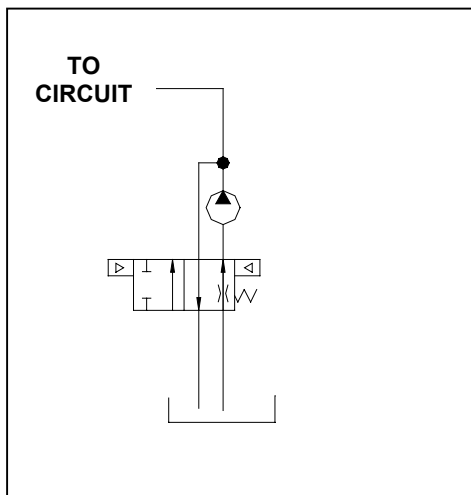
SECTION 3 – PUMP SECTION

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FRONT MOUNT PUMP with DRY VALVE (Commercial)



SEE PUMP SPECIFICATIONS
FOR CIRCUIT GPM AND PSI



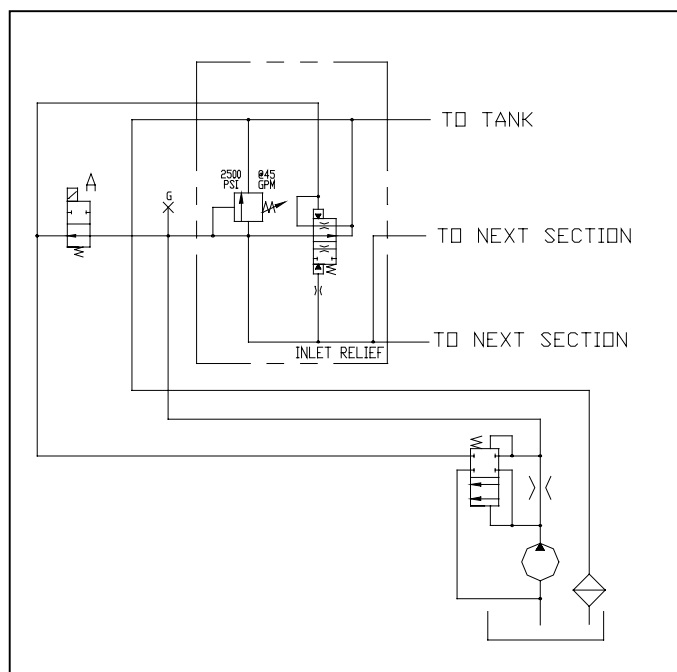
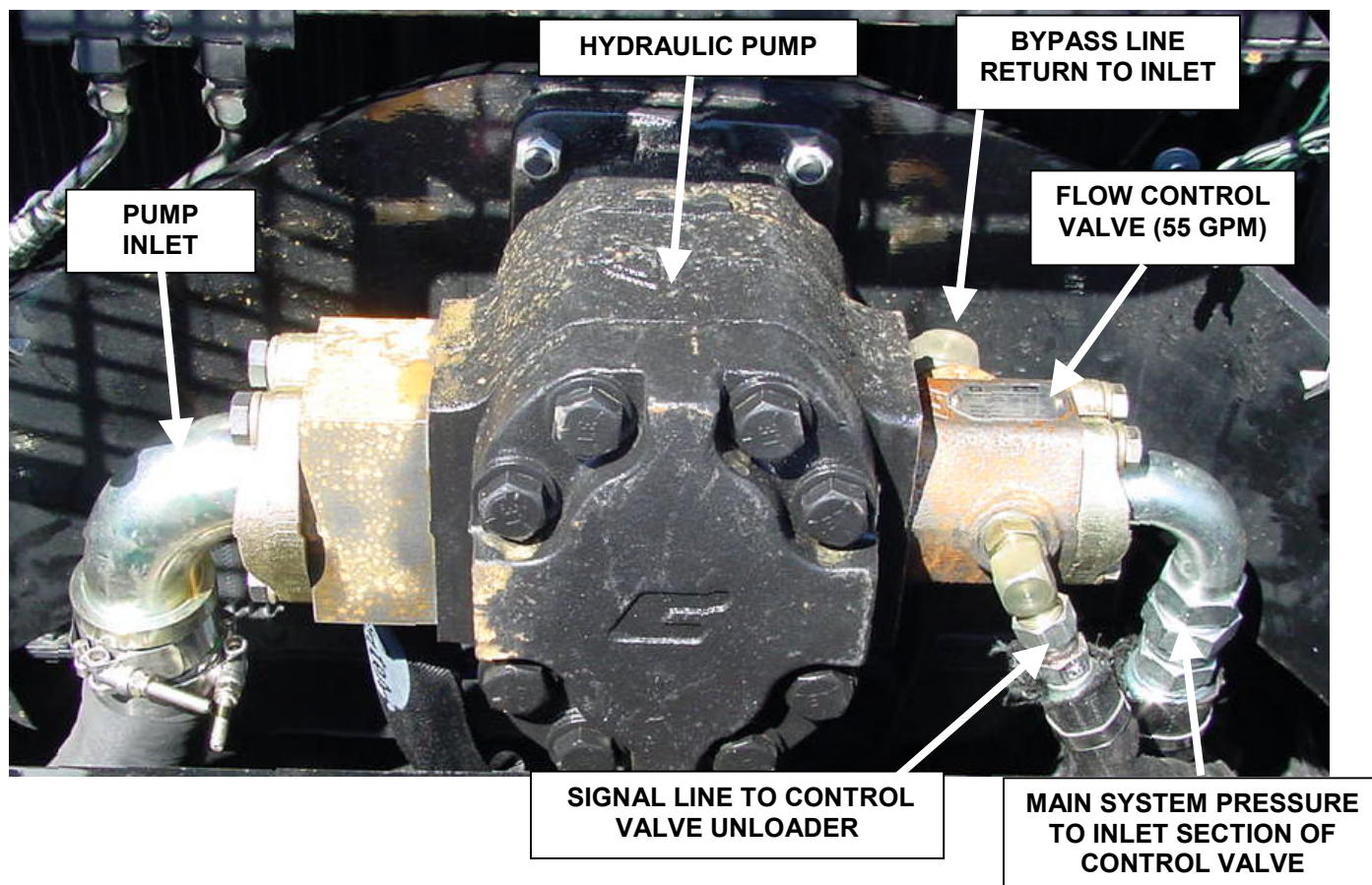
This pump set up does not require a constant flow valve in the off mode. Low neutral pressure is maintained in the off mode with a loop line that goes from the pressure side of the pump through the dry valve and back to the tank.

Air Logic

Pump Off – Apply equal air pressure to both ports “A” and “B” will close the dry valve and turn the pump off

Pump On – Apply air pressure to port “A” and release air pressure from port “B” will open the dry valve and turn the pump on

COMMERCIAL FRONT MOUNT – HOC (FEL)



THE HOC SYSTEM IS DESIGNED TO UNLOAD THE HYDRAULIC SYSTEM WHEN THE PUMP FLOW EXCEEDS 55 GPM.

HYDRAULIC SYSTEM UNLOADING OCCURS WHEN THE PRESSURE DROP ACROSS THE FLOW CONTROL ORIFICE REACHES 50 PSI.

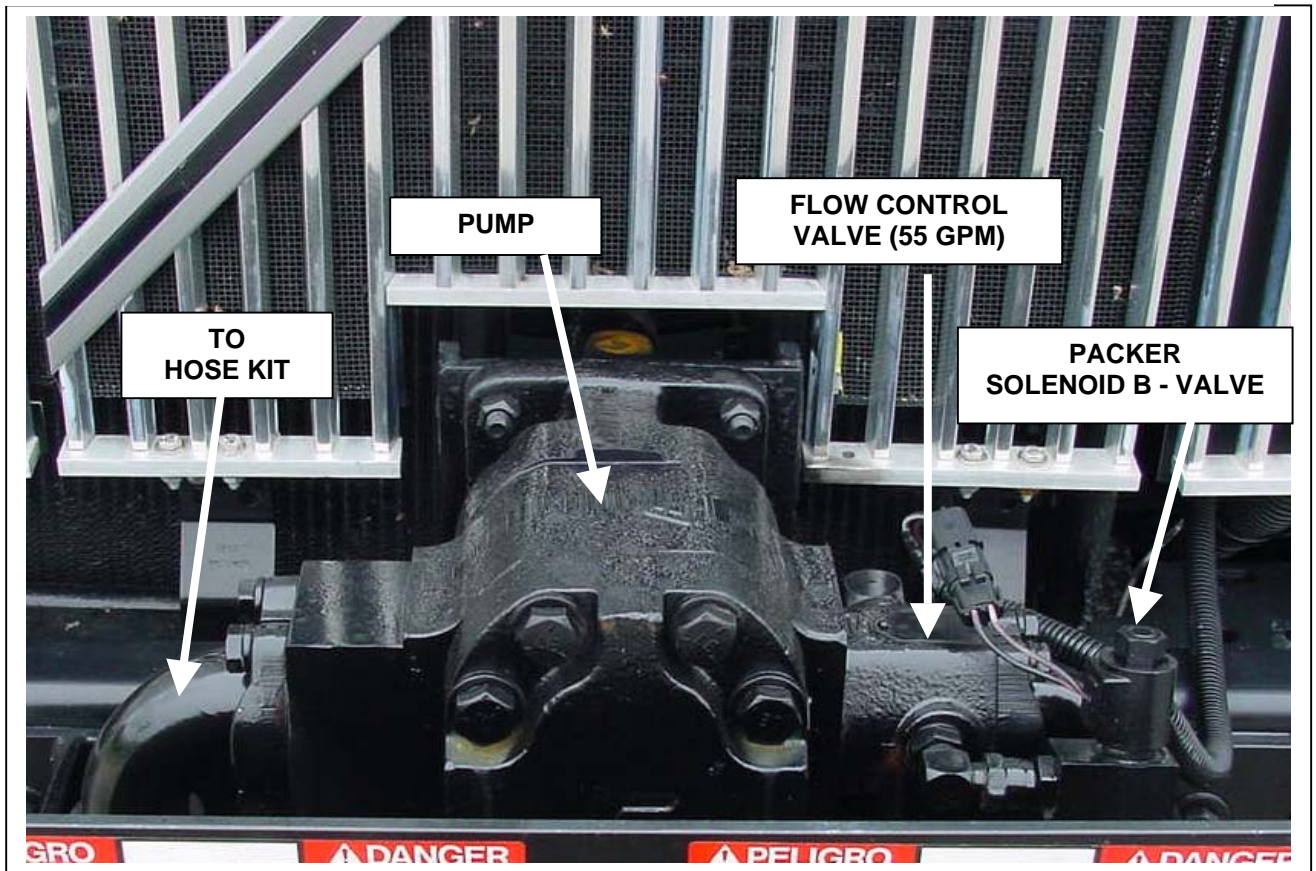
TO RESTORE POWER TO THE HYDRAULIC SYSTEM, THE OPERATOR MUST LOWER THE ENGINE SPEED 300 TO 400 RPM BELOW THE HOC SPEED SETTING

COMMERCIAL HOC MAIN CONTROL VALVE – (FEL)

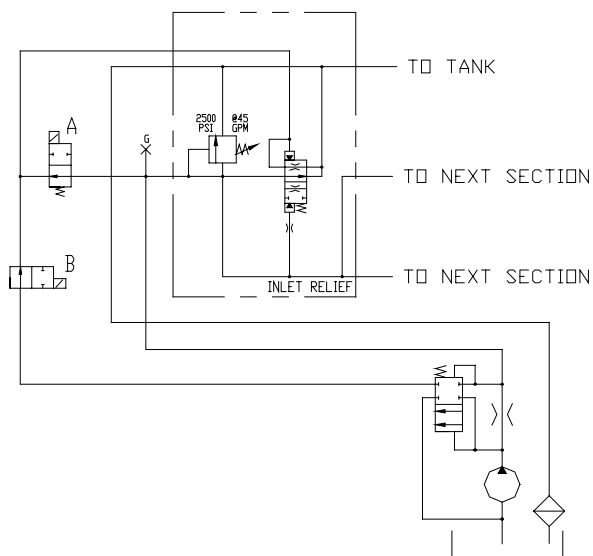
THE NORMALLY OPEN PUMP SHUT OFF VALVE IS ENERGIZED BY THE PLC MAIN PUMP OUTPUT. THIS HYDRAULIC SYSTEM IS PROTECTED BY THE HOC SYSTEM AND DOES NOT USE THE PLC ELECTRONIC OVERSPEED.

COMMERCIAL FRONT MOUNT (HOC) for PYTHON USED ON EARLIER UNITS

3.4



NOTE:
SOLENOID "A" IS ENERGIZED WHEN THE PUMP SWITCH IS ON
SOLENOID "B" IS ENERGIZED WHEN THE PACKER IS OPERATING



THE HOC SYSTEM IS DESIGNED TO UNLOAD THE HYDRAULIC SYSTEM WHEN THE PUMP FLOW EXCEEDS 55 GPM.

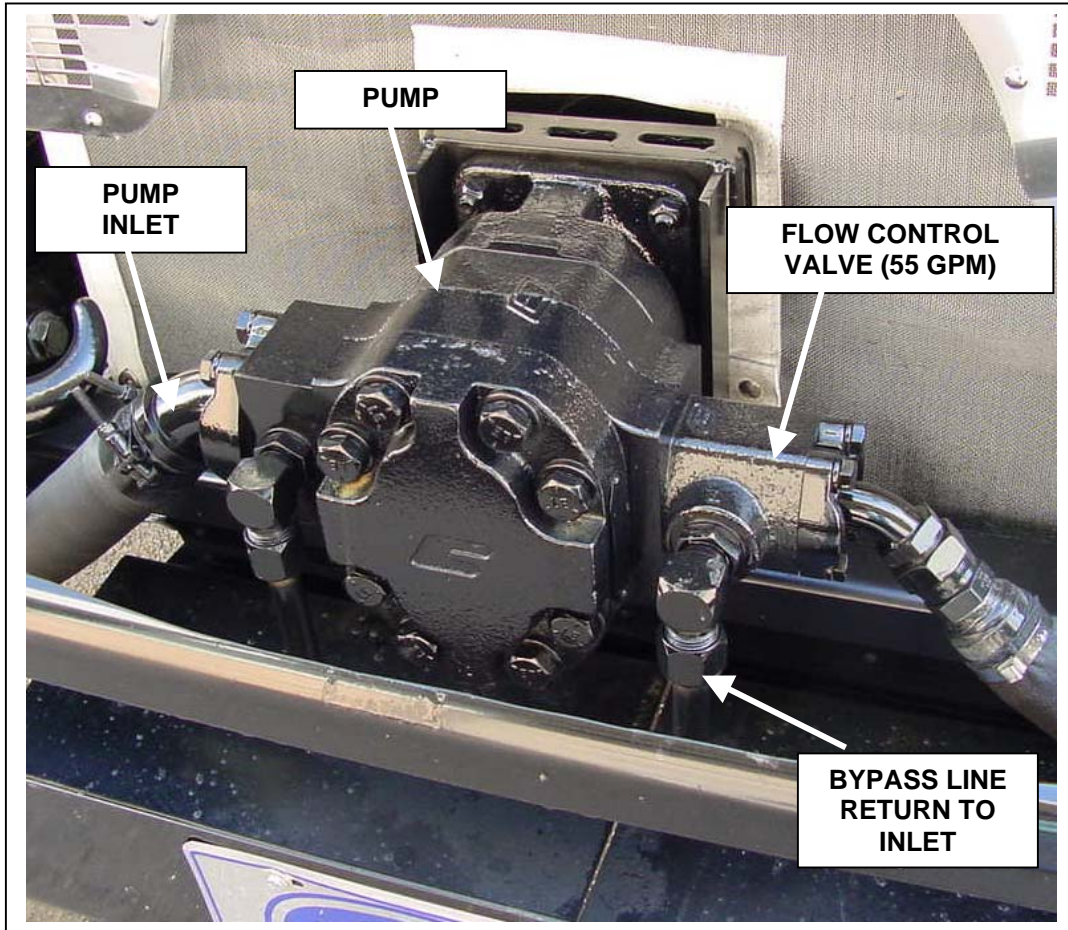
HYDRAULIC SYSTEM UNLOADING OCCURS WHEN THE PRESSURE DROP ACROSS THE FLOW CONTROL ORIFICE REACHES 50 PSI.

TO RESTORE POWER TO THE HYDRAULIC SYSTEM THE OPERATOR MUST LOWER THE ENGINE SPEED 300 TO 400 RPM BELOW THE HOC SPEED SETTING.

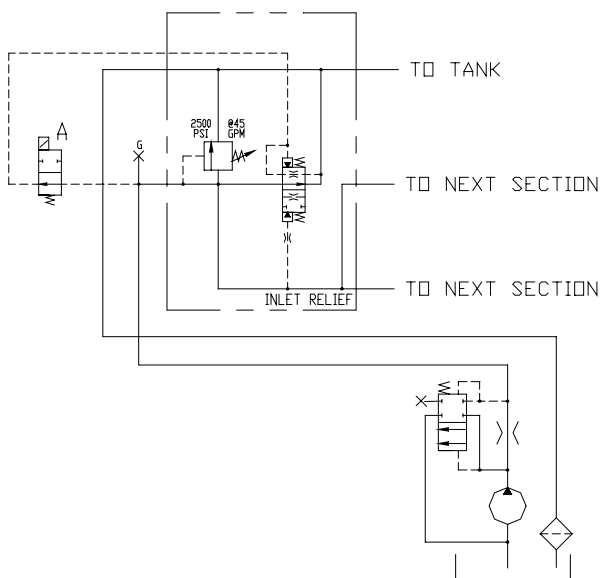
SOLENOID 'A' IS LOCATED ON THE LIFT CONTROL VALVE – SEE LIFT SECTION.

COMMERCIAL FRONT MOUNT (HOC) for PYTHON USED ON LATEST UNITS

3.4.1



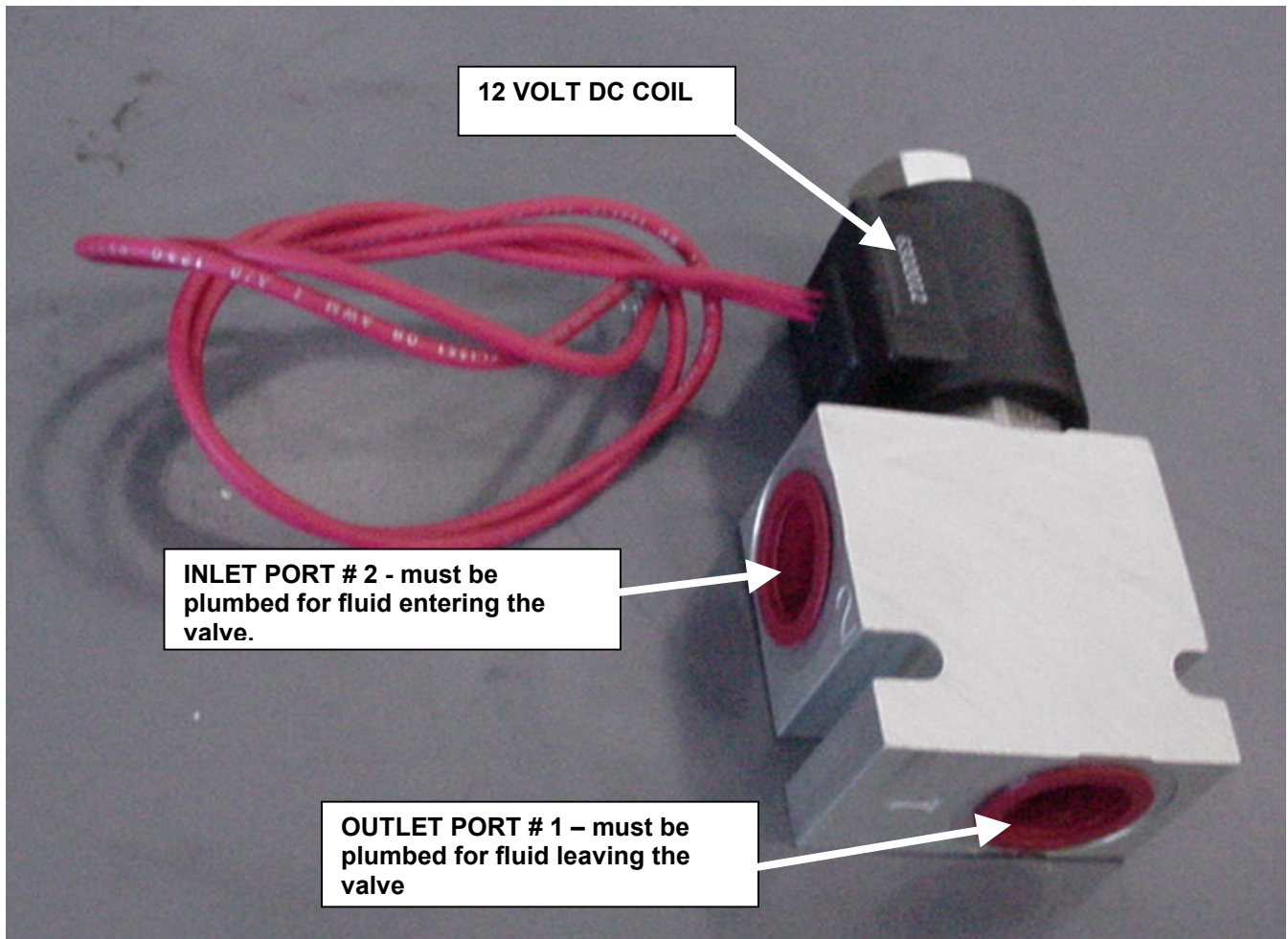
NOTE
SOLENOID "A" IS ENERGIZED WHEN THE PUMP SWITCH IS ON, IN PACK MODE AND LESS THAN EOS SETTING



THE HOC SYSTEM IS DESIGNED TO LIMIT THE HYDRAULIC SYSTEM PUMP FLOW TO 55 GPM.

SOLENOID 'A' IS LOCATED ON THE LIFT CONTROL VALVE – SEE LIFT SECTION.

**PUMP SHUT-OFF VALVE 31-5796
USED WITH COMMERCIAL HOC SYSTEM**



This style of pump shut off valve is normally open and closes when the coil is activated. The valve does not have a plumbing schematic on it but must be plumbed one way to function properly. Fluid must enter port # 2 and exit port # 1.

Caution: Failure to plumb the pump shut off valve in this manner may cause system malfunction or “system chatter”.

FLOW CONTROL VALVE TESTING for HOC PUMP

Follow these steps for testing.

1. Warm hydraulic system temperature to 120°F.

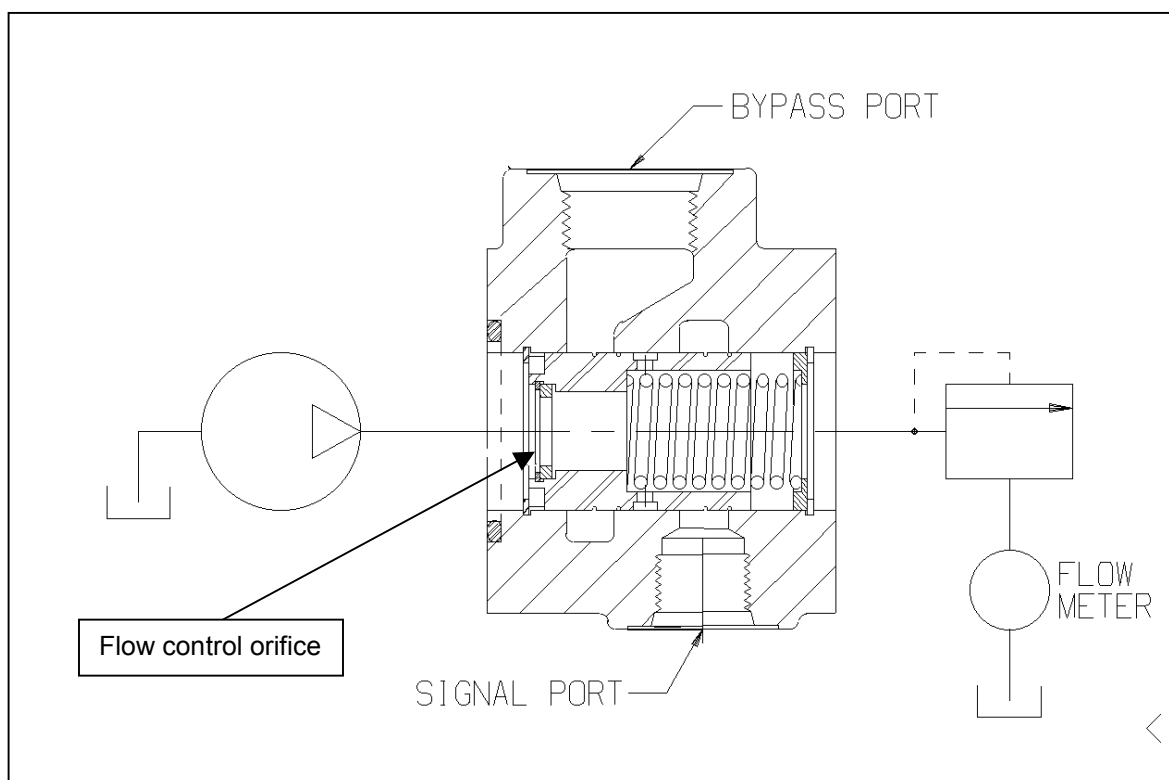
BYPASS and BINDING TEST

1. Increase oil flow through the flow control valve until 55 GPM is reached.
2. Oil should start flowing from the bypass port. Record the flow going through valve when the oil starts bypassing.
3. Cycle two or three more times to be sure valve spool moves freely and does not bind.
4. The valve should bypass oil at +/- 3 GPM of the 55 GPM flow.
5. Check for correct orifice in spool if valve exceeds 55 GPM.

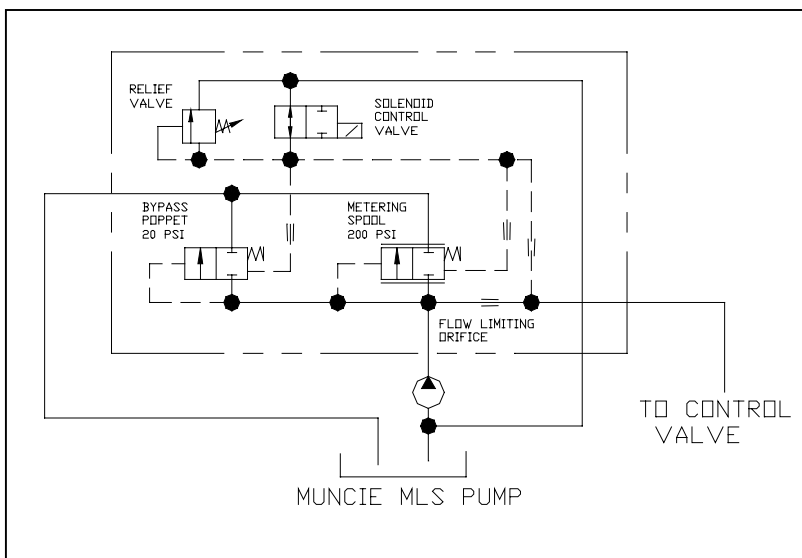
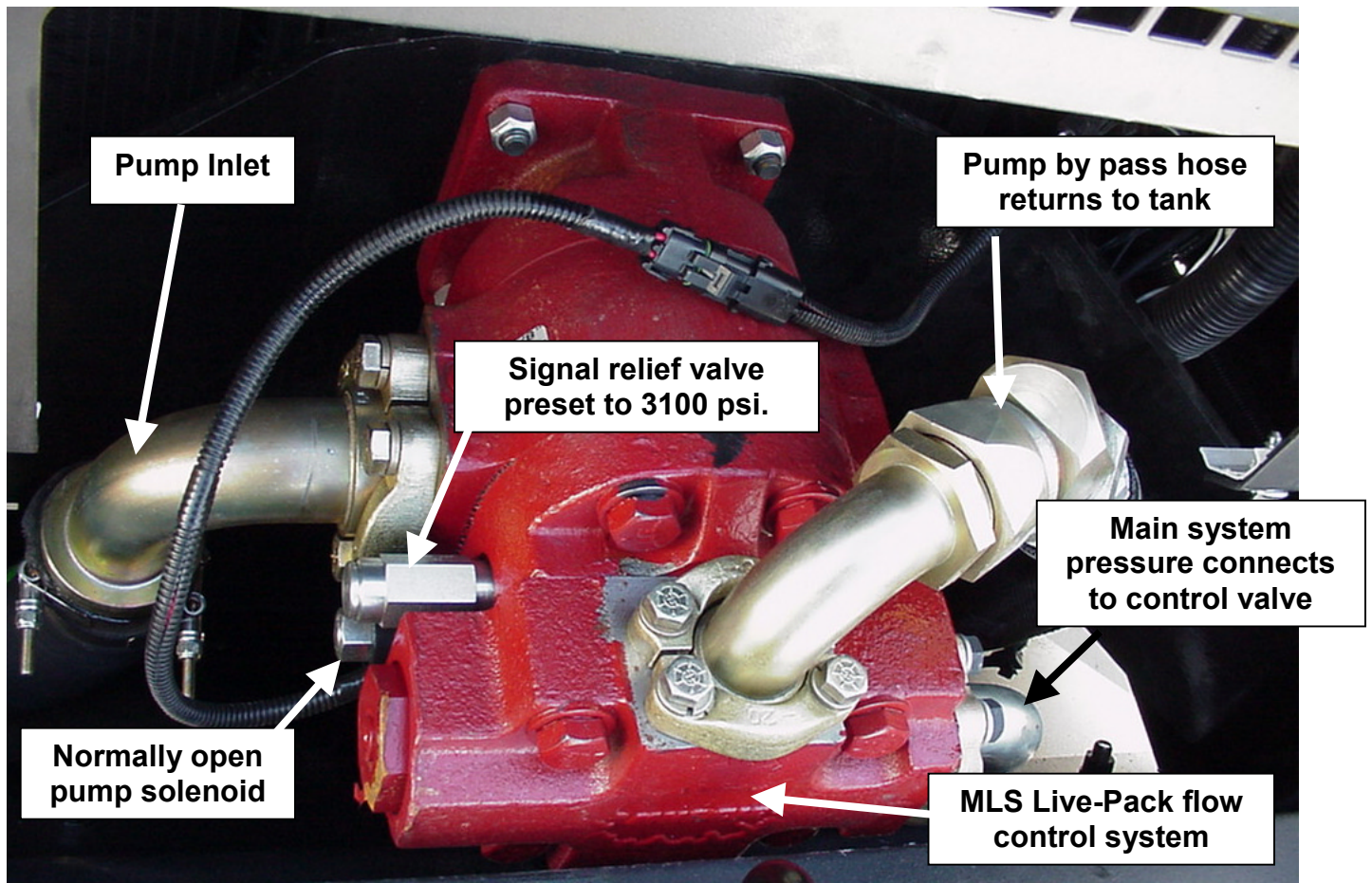
FLOW CONTROL LEAKAGE TEST

Check valve spool leakage by running 5 GPM less than the actual flow of 55 GPM through the valve with 1100 PSI on the flow control valve outlet. The flow control leakage should not exceed 1000 CC/Minute (about 1/4 GPM) from the valve signal port.

ORIFICE PART NO	GPM
031-5776-001	55-60
031-5776-002	50-54
031-5776-003	45-49
031-5776-004	40-44
031-5776-005	35
031-5776-006	20



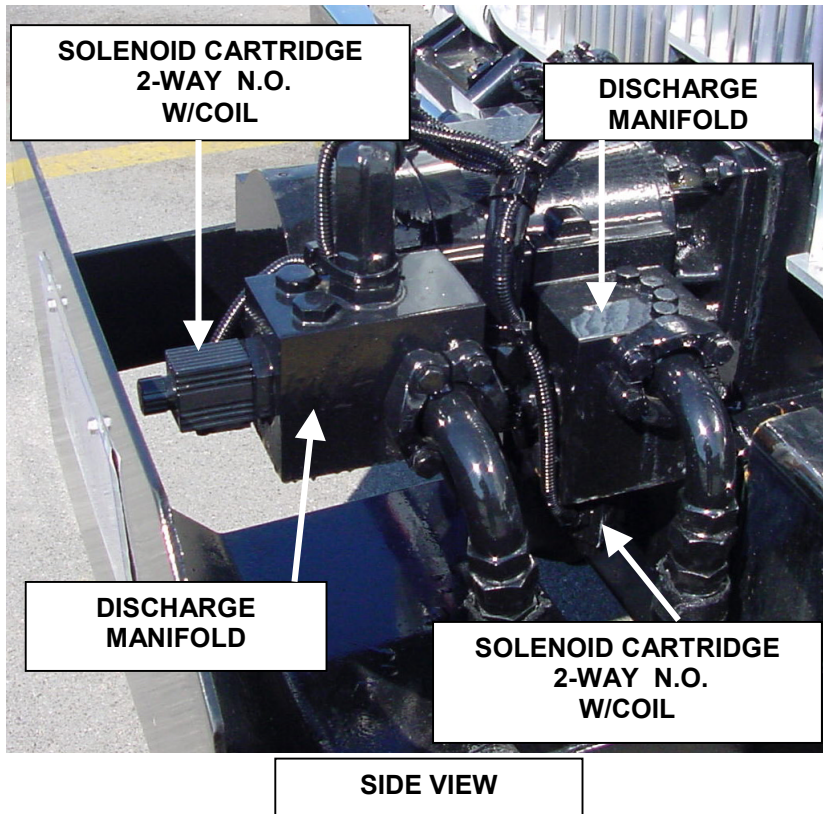
MUNCIE MLS LIVE – PACK PUMP



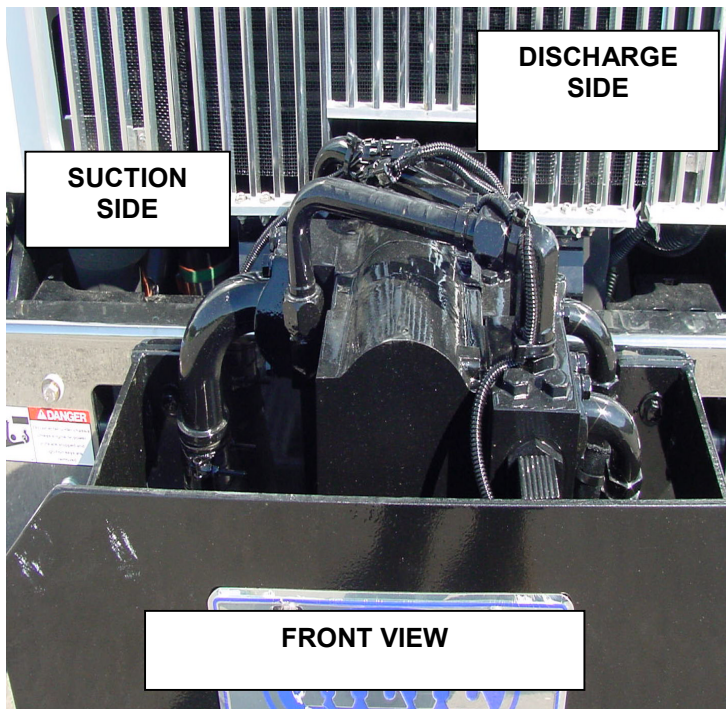
The internal by-pass poppet is open whenever the pump is turning and the pump solenoid is open to unload the system

The internal modulating spool adjusts to maintain a 200 psi differential between the pump outlet and the signal sensing circuit

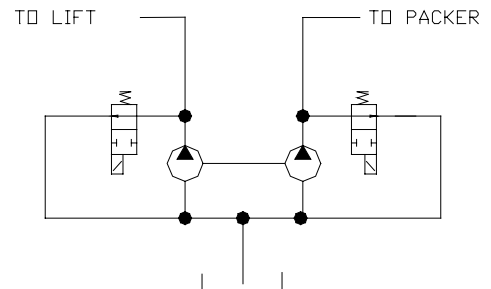
The signal relief valve unloads only the signal pressure to the inlet of the pump. It does not serve as the system main relief



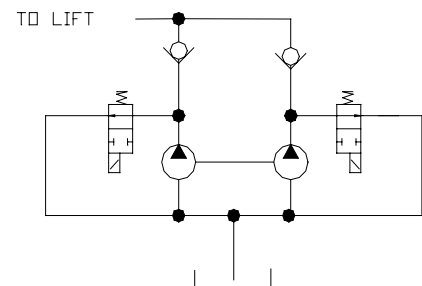
This gear pump uses two normally open directional control valves to engage each pump section. In the off mode oil is diverted back to the inlet side of the pump. In the on mode oil is directed to the appropriate circuit.

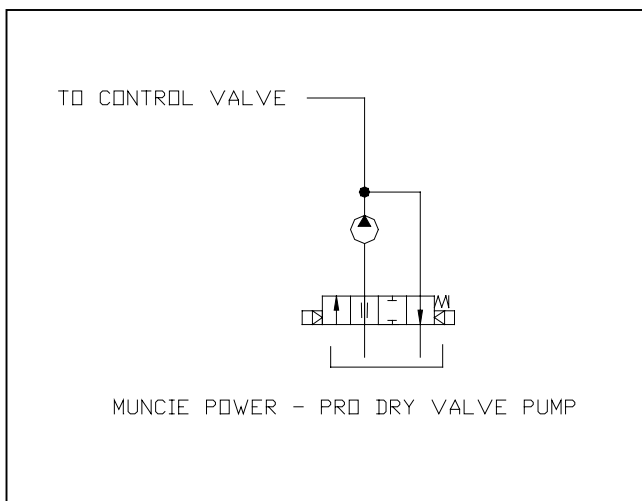
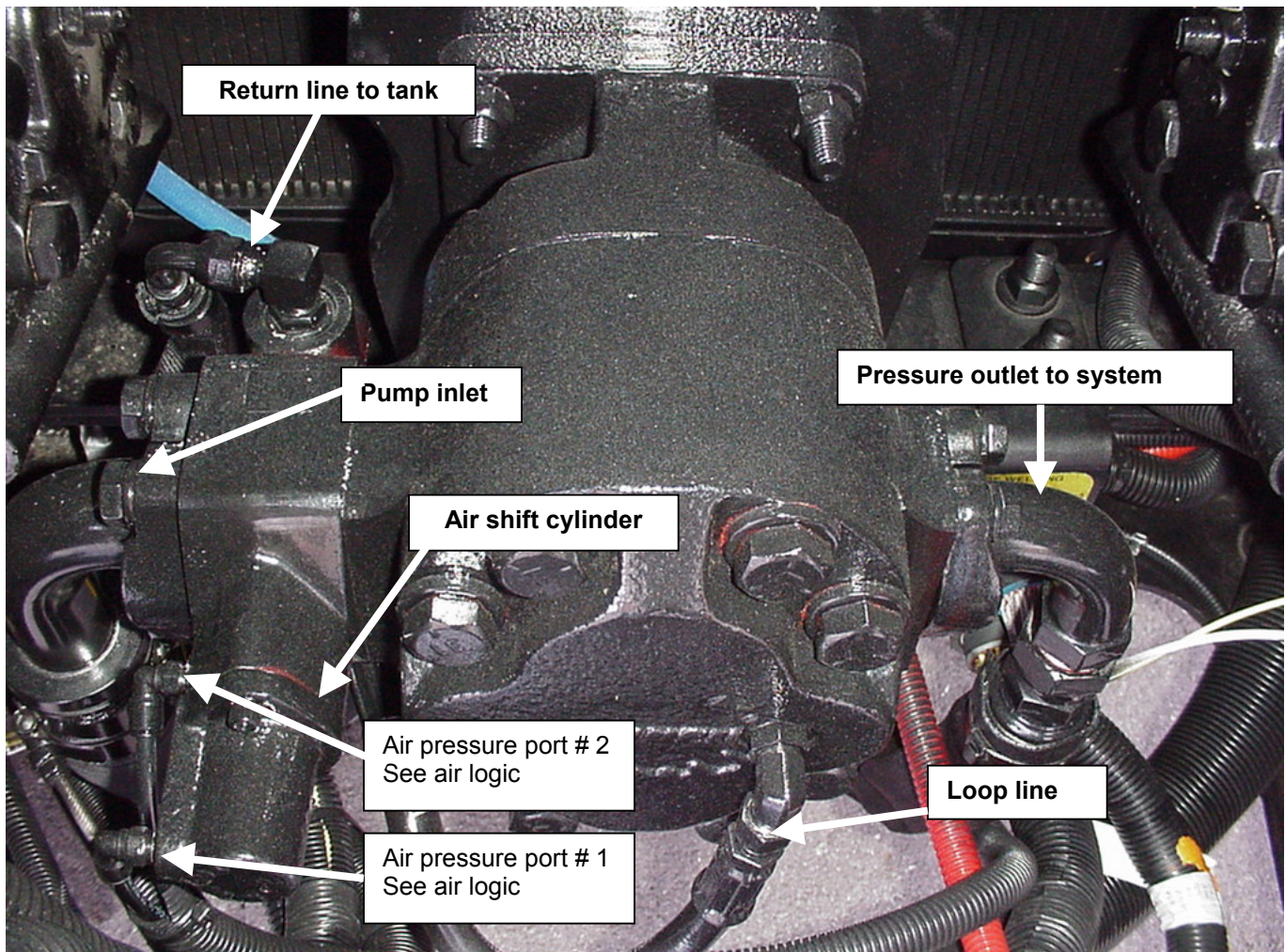


EARLY POWER LIFT CIRCUIT



POWERLIFT/F7000 / CP PYTHON CIRCUIT



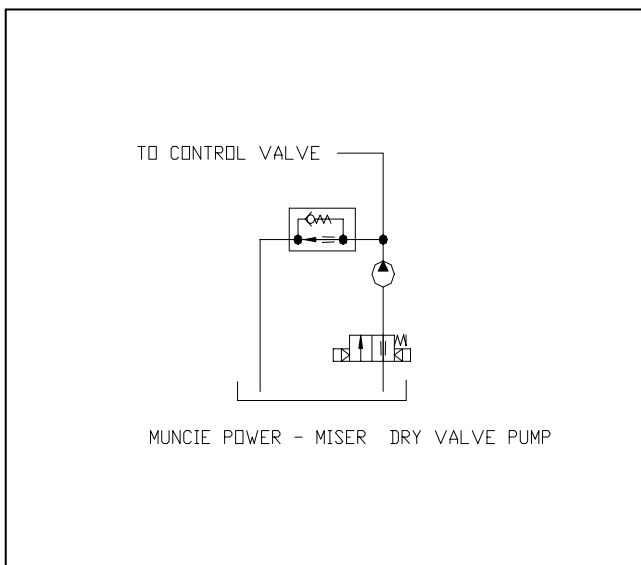
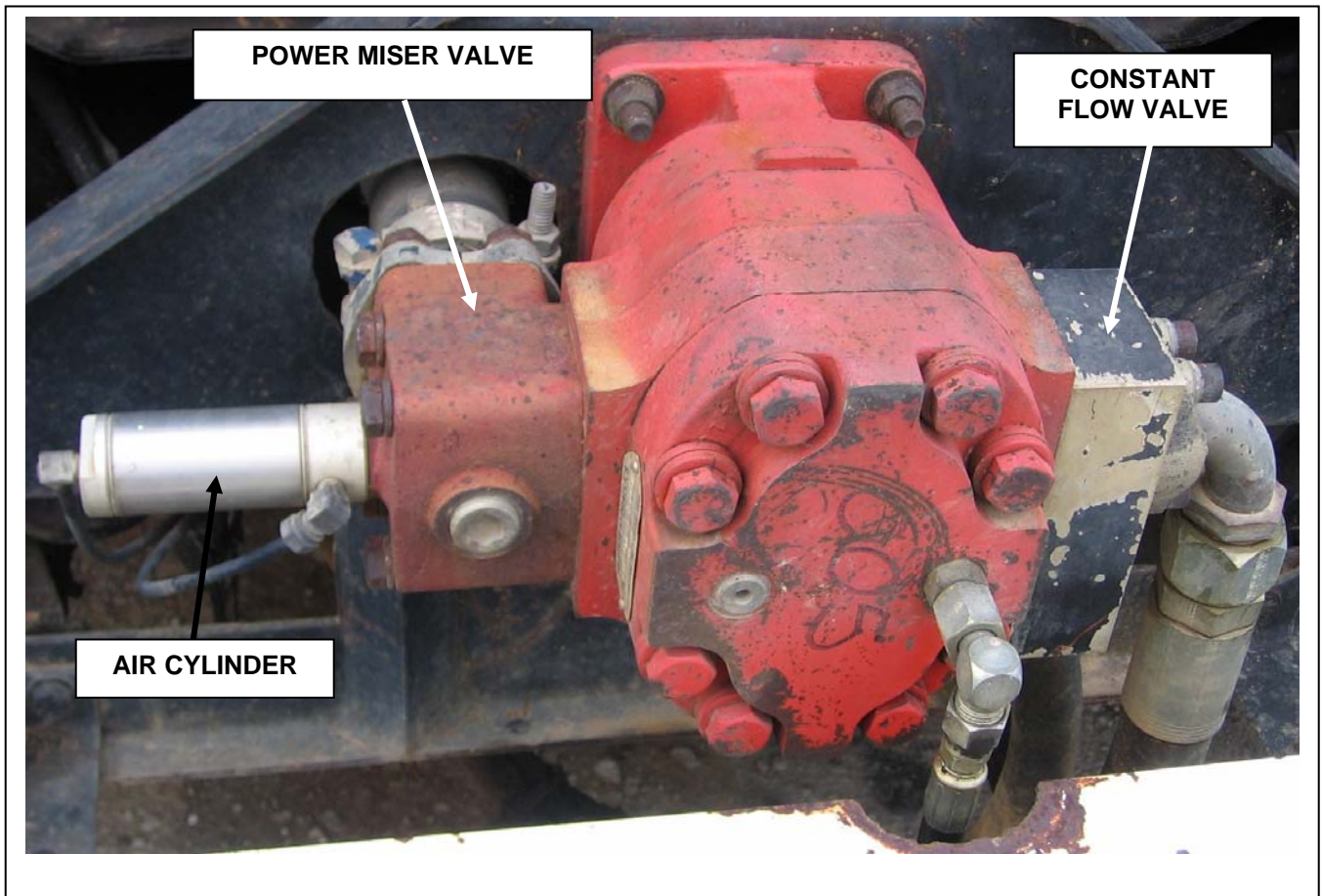


This pump set up does not require a constant flow valve in the off mode. The power pro dry valve system allows pump cooling and lubrication through the loop line and back to the tank when the system is in the off mode. In the on mode the loop line is closed to tank and all fluid is sent downstream to system pressure

Air Logic

Pump ON – Apply air pressure to port # 1 and release air from port # 2

Pump Off – Release air pressure from port #1 and apply air pressure to port #2



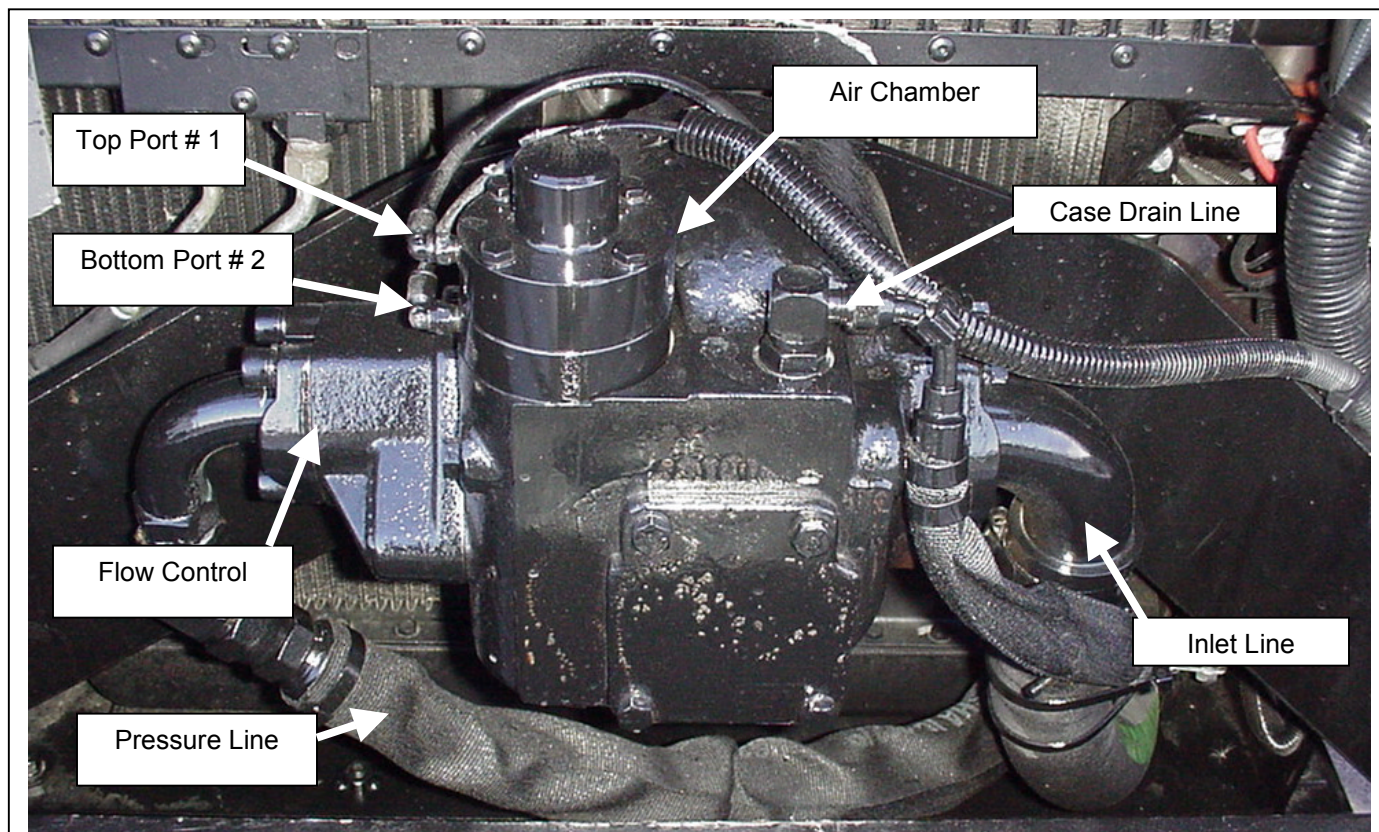
This pump set up requires a constant flow valve to maintain a low neutral pressure in the off mode. The constant flow valve allows 2-3 GPM to drain back to tank at all times.

Air Logic

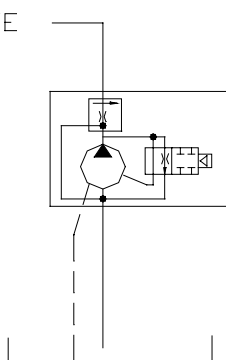
Pump ON – Apply air pressure to port # 1 and release air from port # 2

Pump Off – Release air pressure from port #1 and apply air pressure to port #2

TYRONE 257 SERIES PUMP



TO CONTROL VALVE



TYRONE FPW257 PUMP

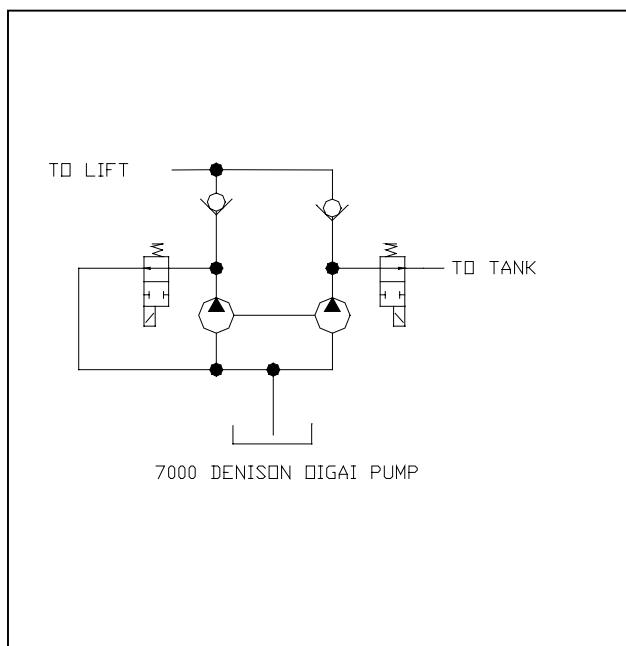
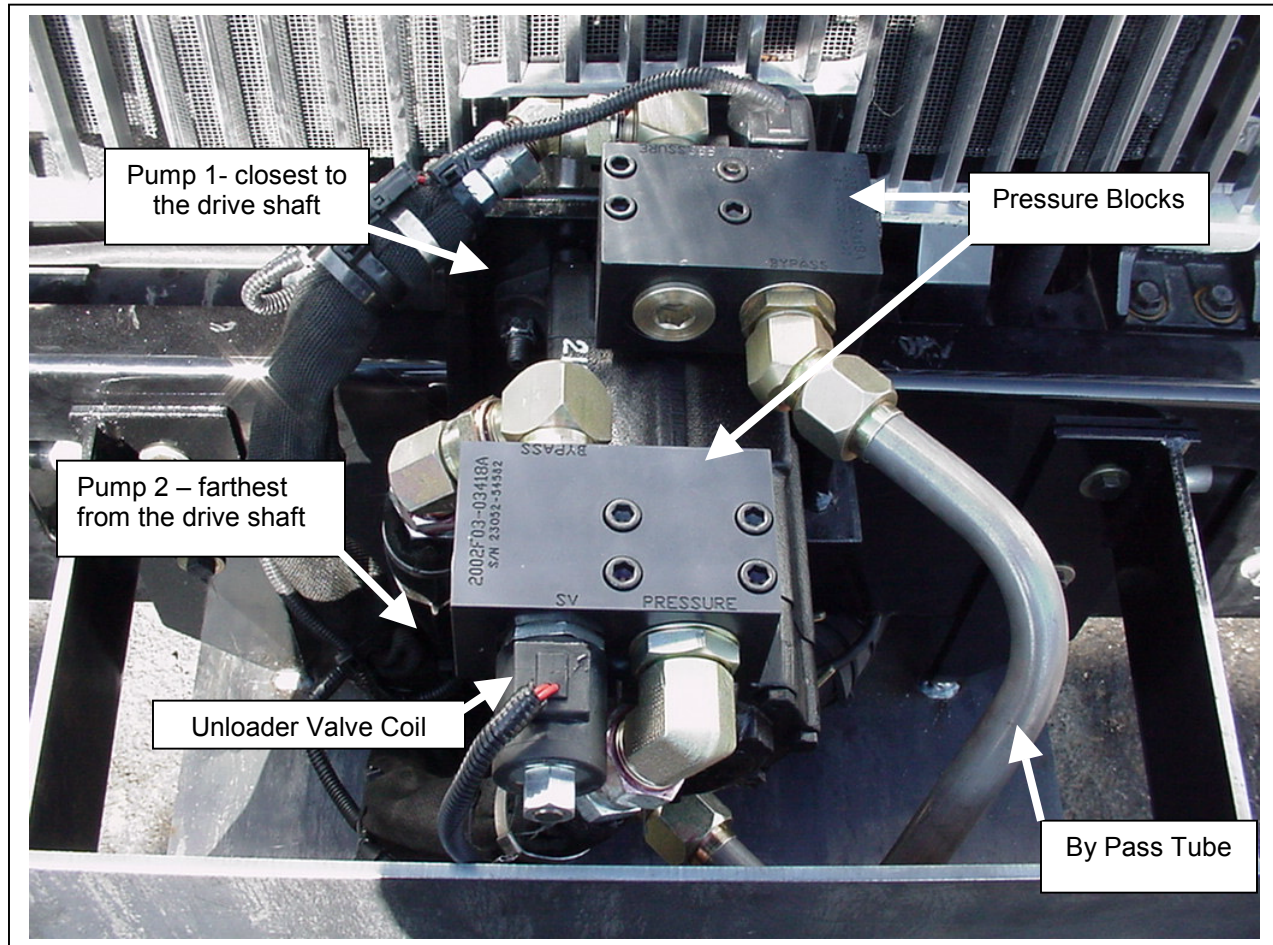
The Tyrone 257 series gear pump uses a flow control that diverts excess oil back to the inlet side of the pump through an internal loop passage.

During the off mode of the pump, the unloader spool internally unloads the pressure port to the inlet port and opens an internal lubrication passage to the shaft bearings. The case drain line provides positive lube circulation when the pump is in the off mode.

Pump ON – Apply air pressure to port # 2 and release air from port # 1

Pump OFF – Release air pressure from port # 1 and release air from port # 2

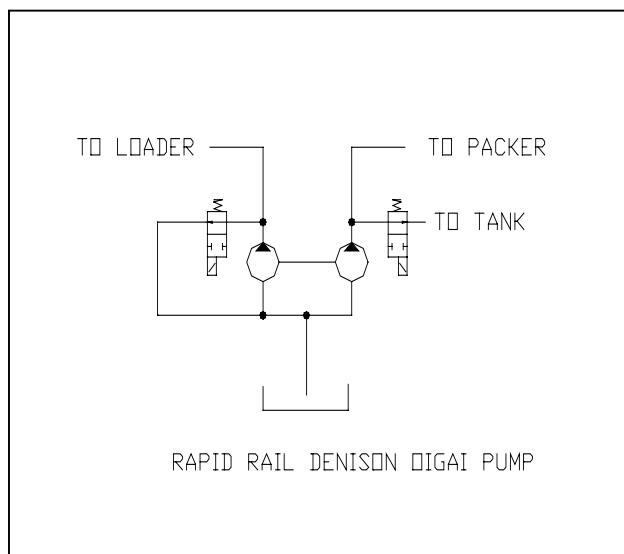
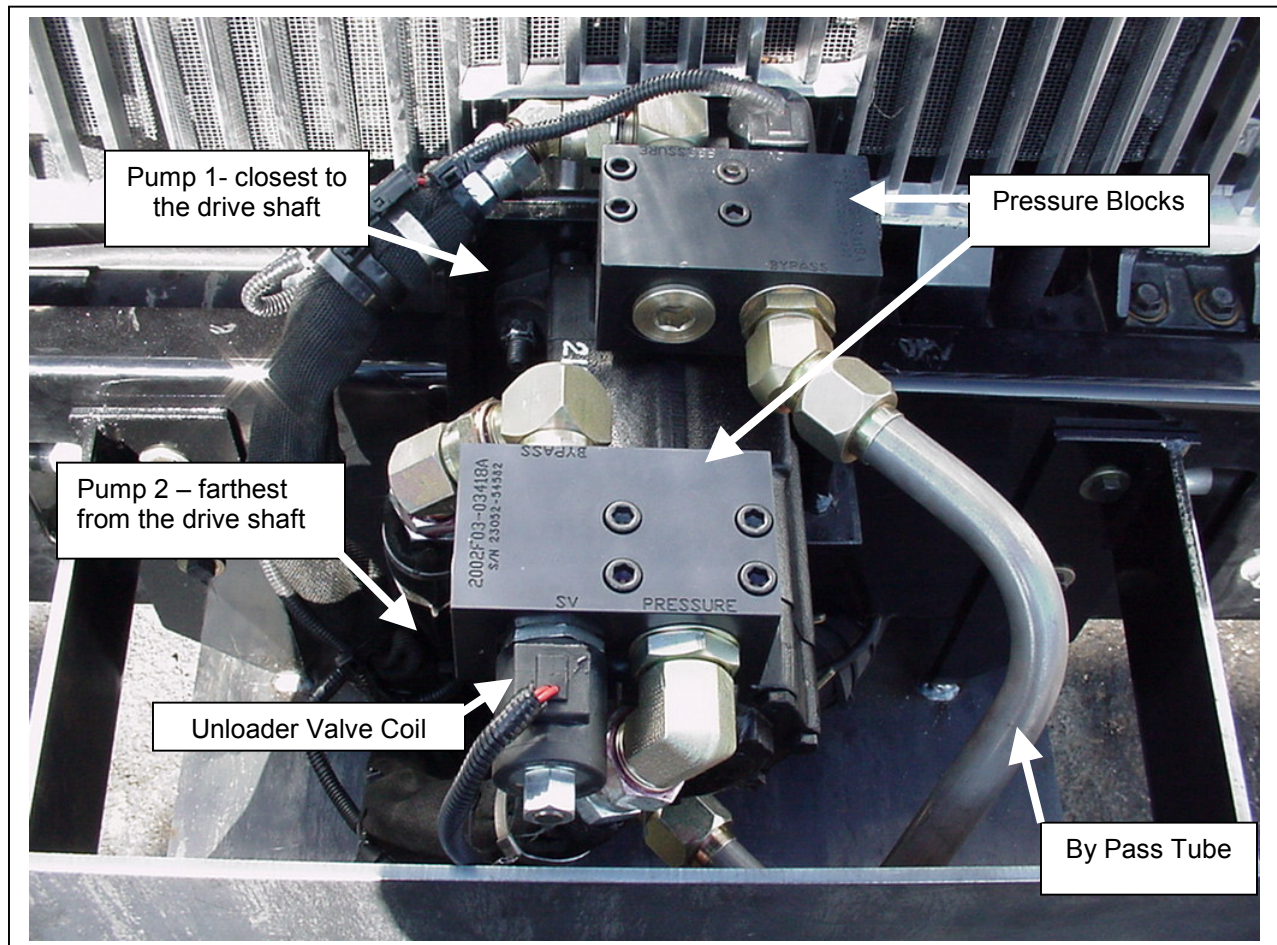
Denison Operate-In-Gear-at-Idle Pump with Hydraulic Controls Pressure Blocks - DPF 7000



This is the Hydraulic Controls Operate In Gear At Idle Hydraulic system. The pump section closest to the input shaft shuts off first. The pump section farthest from the input shaft stays on at higher RPMs. This system combines the flow of both pumps at low RPMs to operate the lift and only one pump at higher RPM to operate the packer. Note: Some systems only use 1 one-way check valve. In this case the one-way check valve must be installed in the pump 1 pressure circuit.

Denison Operate-In-Gear-at-Idle Pump with Hydraulic Controls Pressure Blocks – Raid Rail

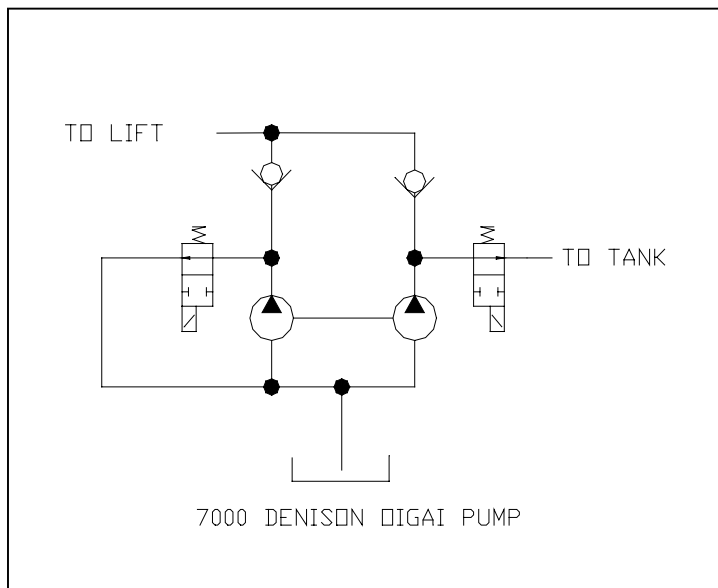
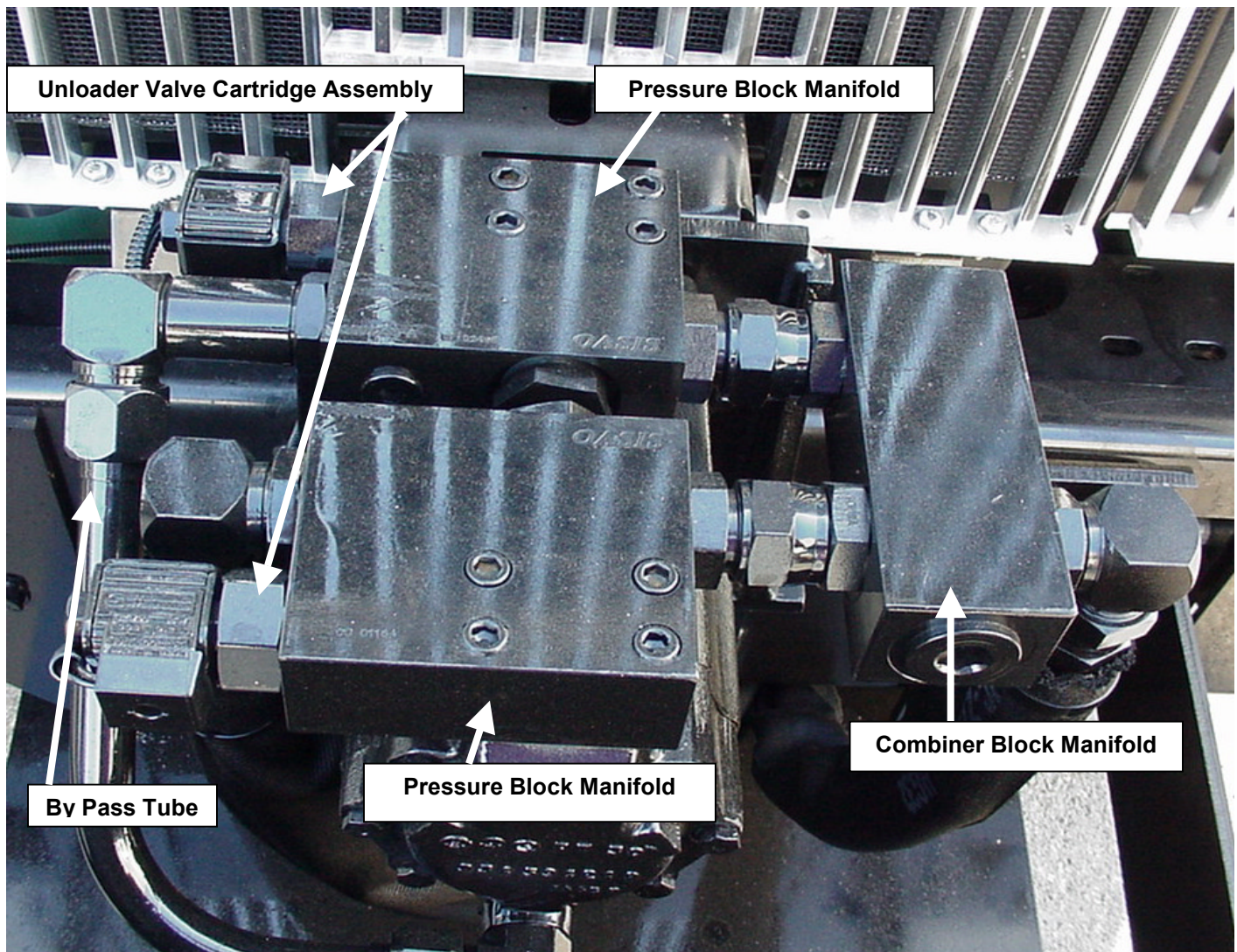
3.12



This is the Hydraulic Controls Operate In Gear At Idle Hydraulic system. The pump section (Pump 1) closest to the input shaft operates the lift and shuts off first. The pump section (Pump 2) farthest from the input shaft operates the packer and stays on at higher RPMs.

ISSUED DECEMBER 2003

Denison Tandem Vane Pump with Oasis Control Manifolds (F7000/DPF7000)

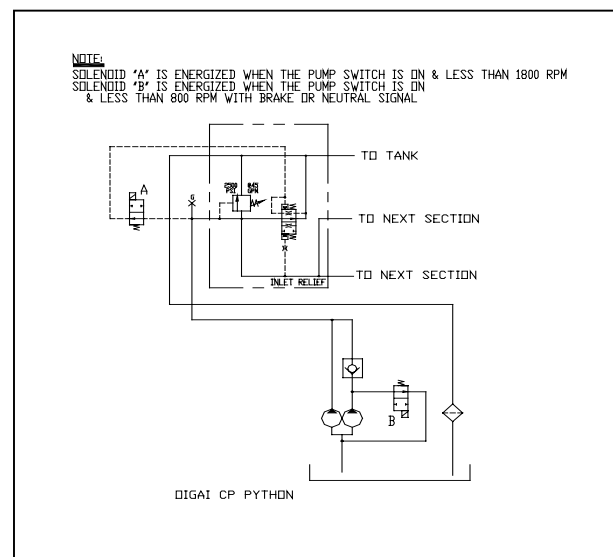
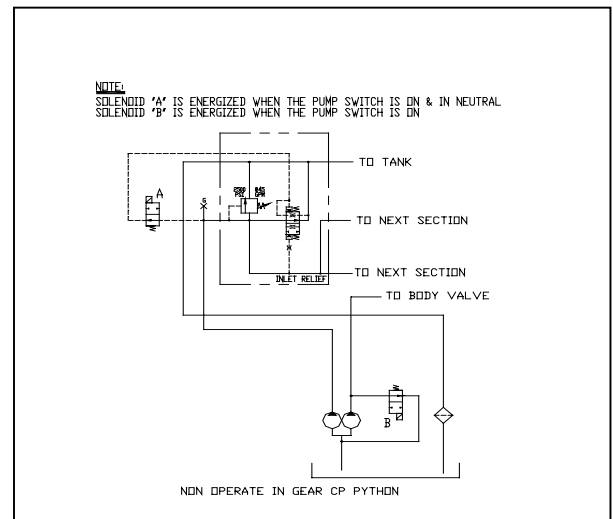
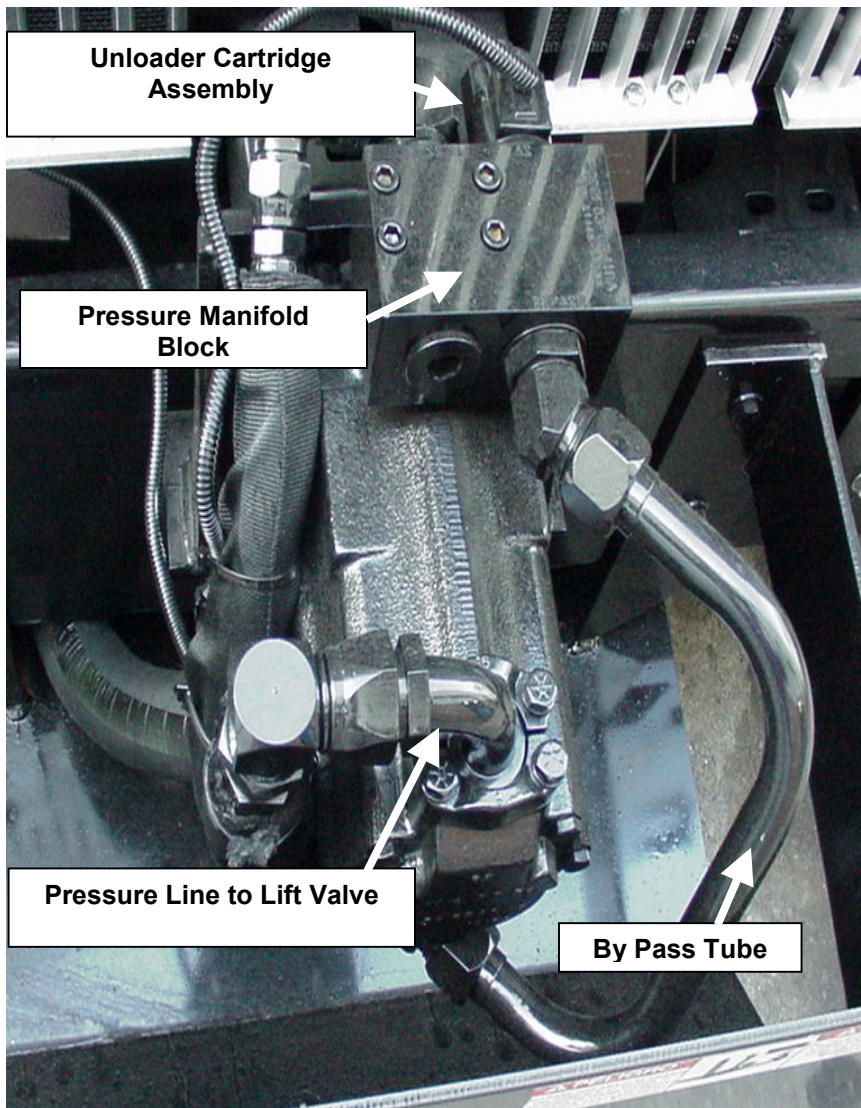


This Denison pump set up uses three manifolds to direct the flow of oil away from the pump to the system pressure circuit.

The two pressure block manifolds each contain an unloader valve cartridge and coil assembly to activate the system and an internal one-way check valve for each pump circuit.

The pump closest to the input shaft shuts off first at lower RPM's while the pump farthest from the input shaft stays on at higher RPM's.

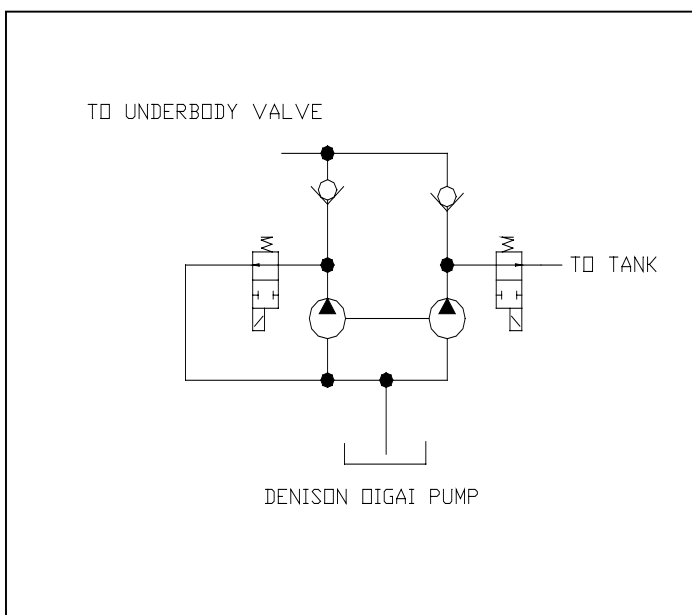
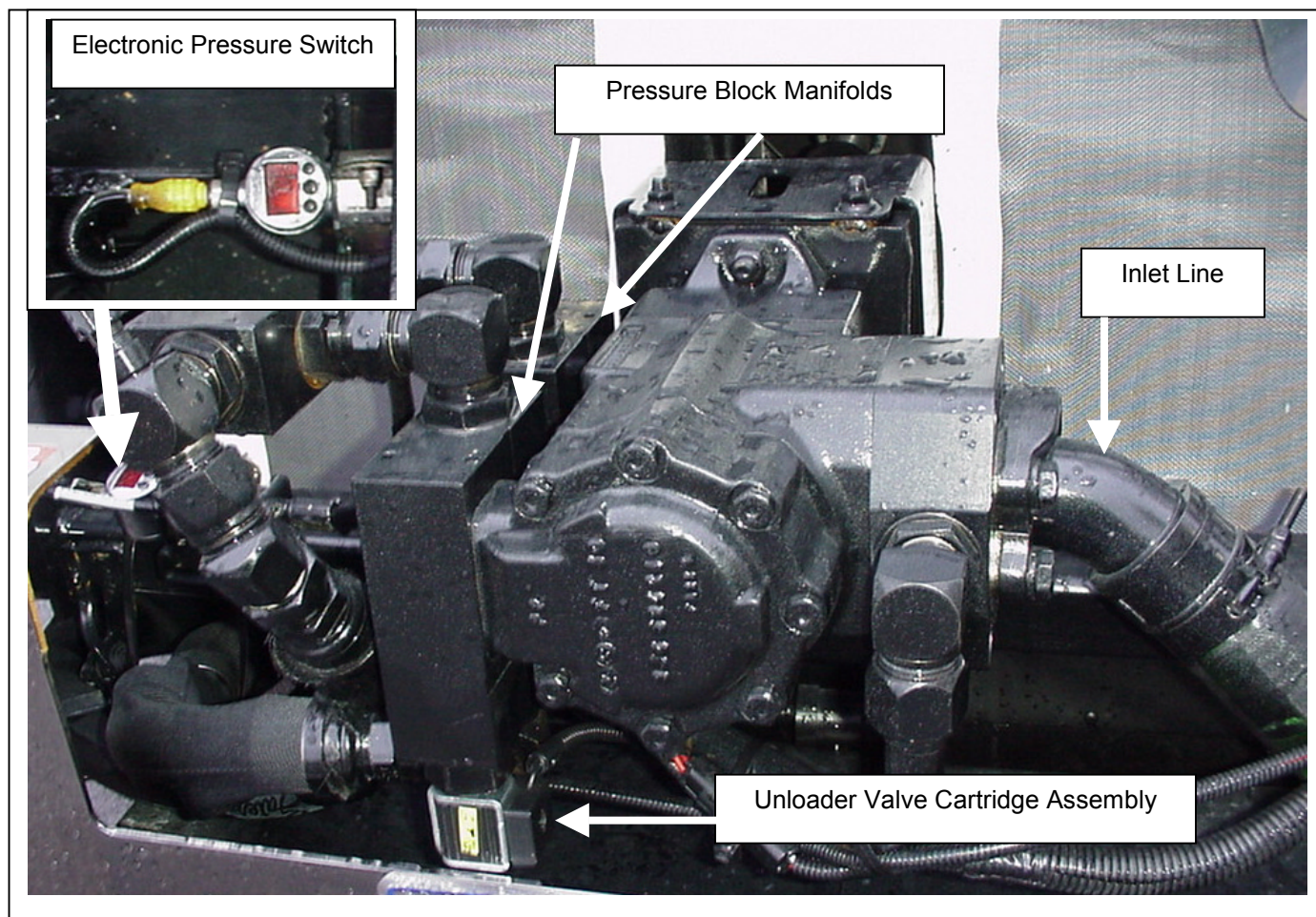
Denison Tandem Vane Pump with Hydraulic Controls Manifold Block (CP Python)



This Denison pump set up can be used on the CP Python with the Commercial HOC inlet unloader valve section. When used in an operate in gear at idle system an extra one way check valve must be installed in the pump section circuit that is closest to the input shaft as it shuts off first at lower RPM's in the OIGAI system.

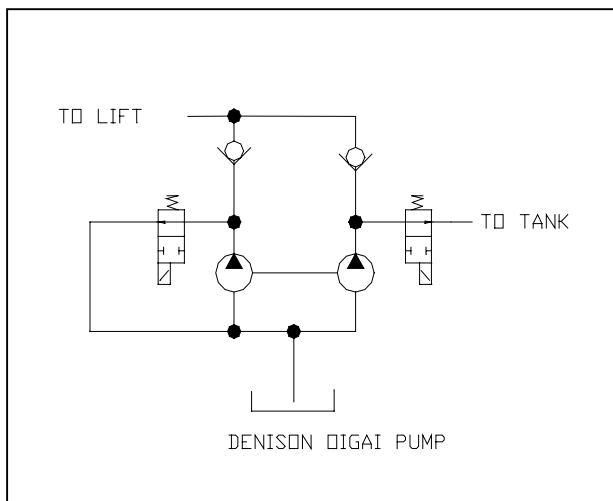
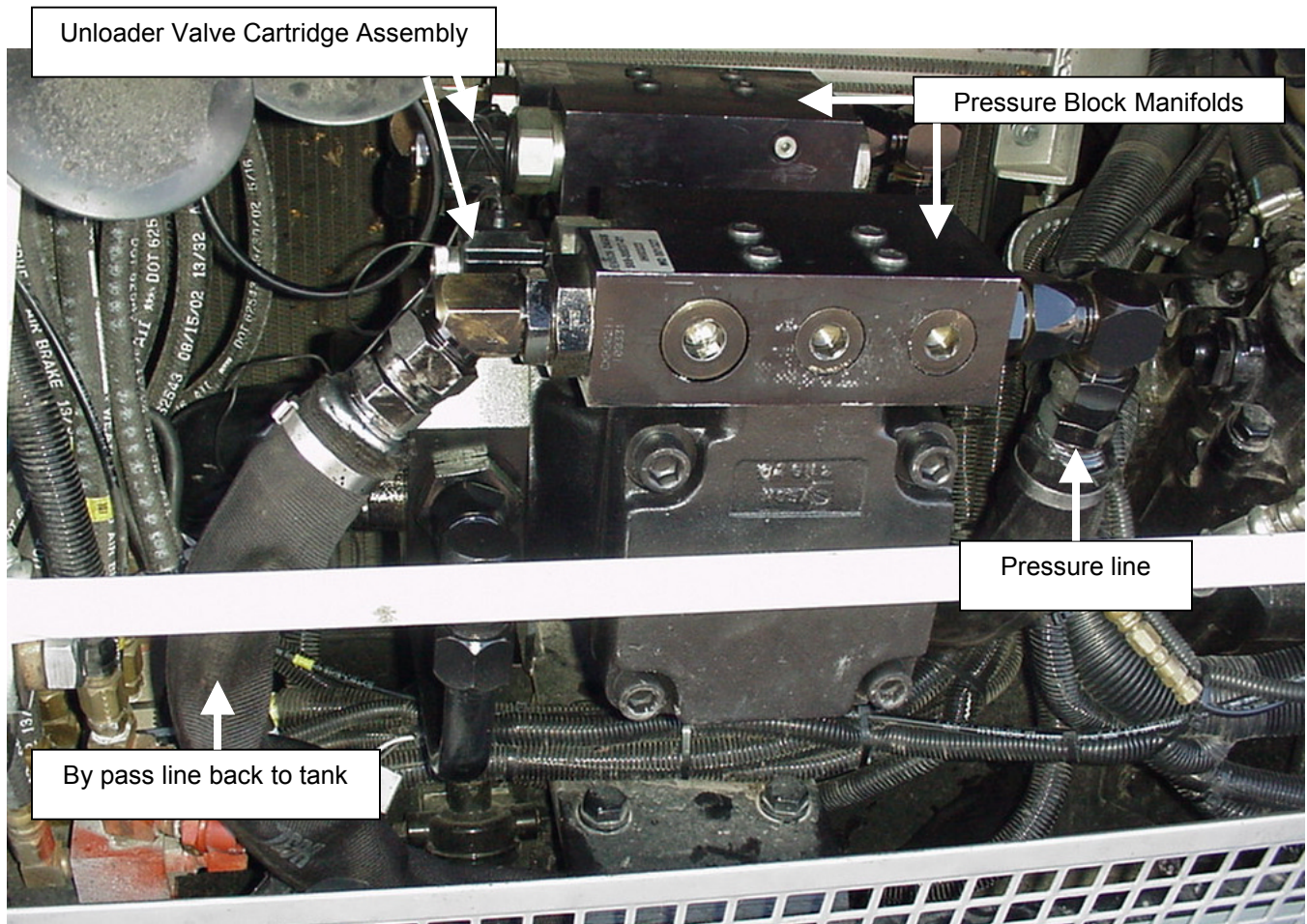
Solenoid "A" is located at the lift valve and is used to unload the lift valve circuit.

DENISON TANDEM VANE PUMP with OASIS CONTROL MANIFOLDS (Rear Loader)



This Denison pump set up uses three manifolds to direct the flow of oil away from the pump to the system pressure circuit. The two pressure block manifolds each contain an unloader valve cartridge and coil assembly to activate the system and an internal one-way check valve for each pump circuit. The pump closest to the input shaft shuts off first at lower RPM's while the pump farthest from the input shaft stays on at higher RPM's.

Denison Tandem Vane Pump with Oasis Control Manifolds (MultiTask)

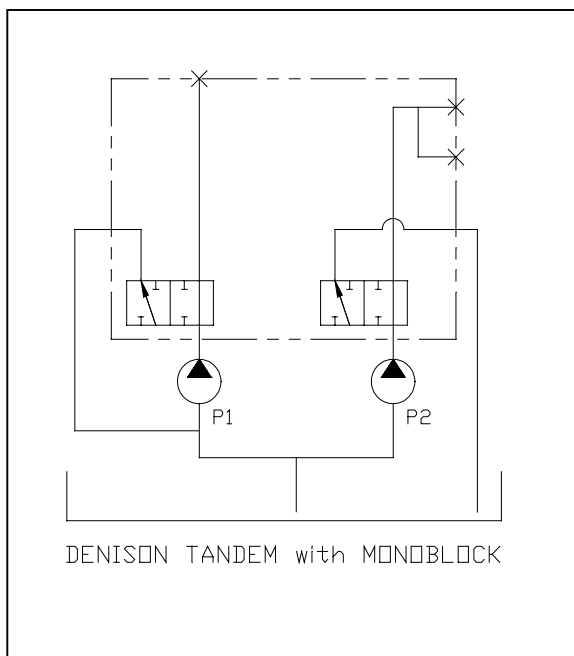
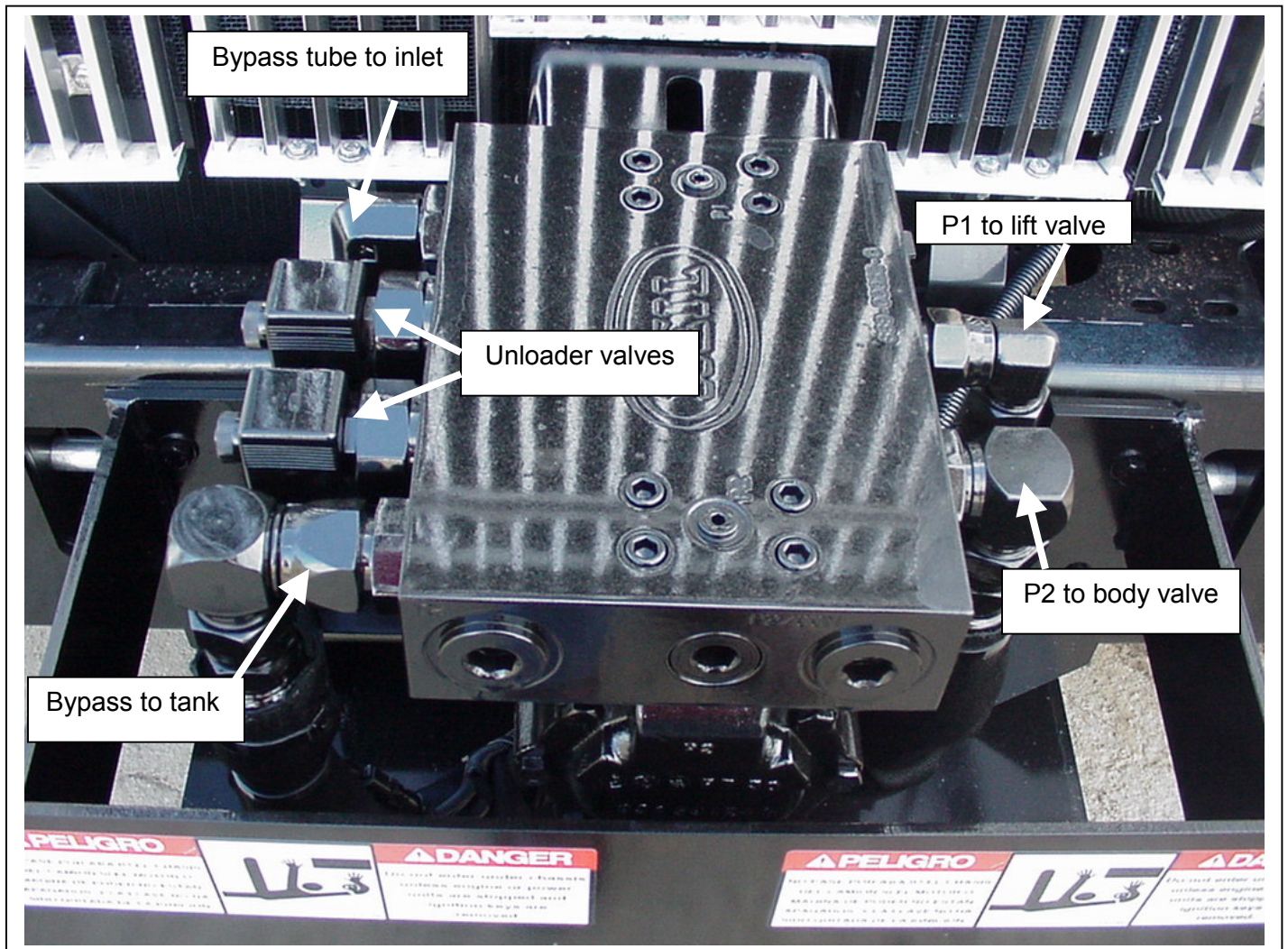


This large displacement Denison pump set up uses two manifolds to direct the flow of oil away from the pump to the system pressure circuit.

The two pressure block manifolds each contain an unloader valve cartridge and coil assembly to activate the system and an internal one-way check valve for each pump circuit.

The pump closest to the input shaft shuts off first at lower RPM's while the pump farthest from the input shaft stays on at higher RPM's.

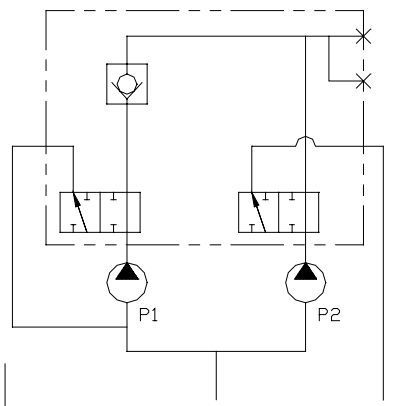
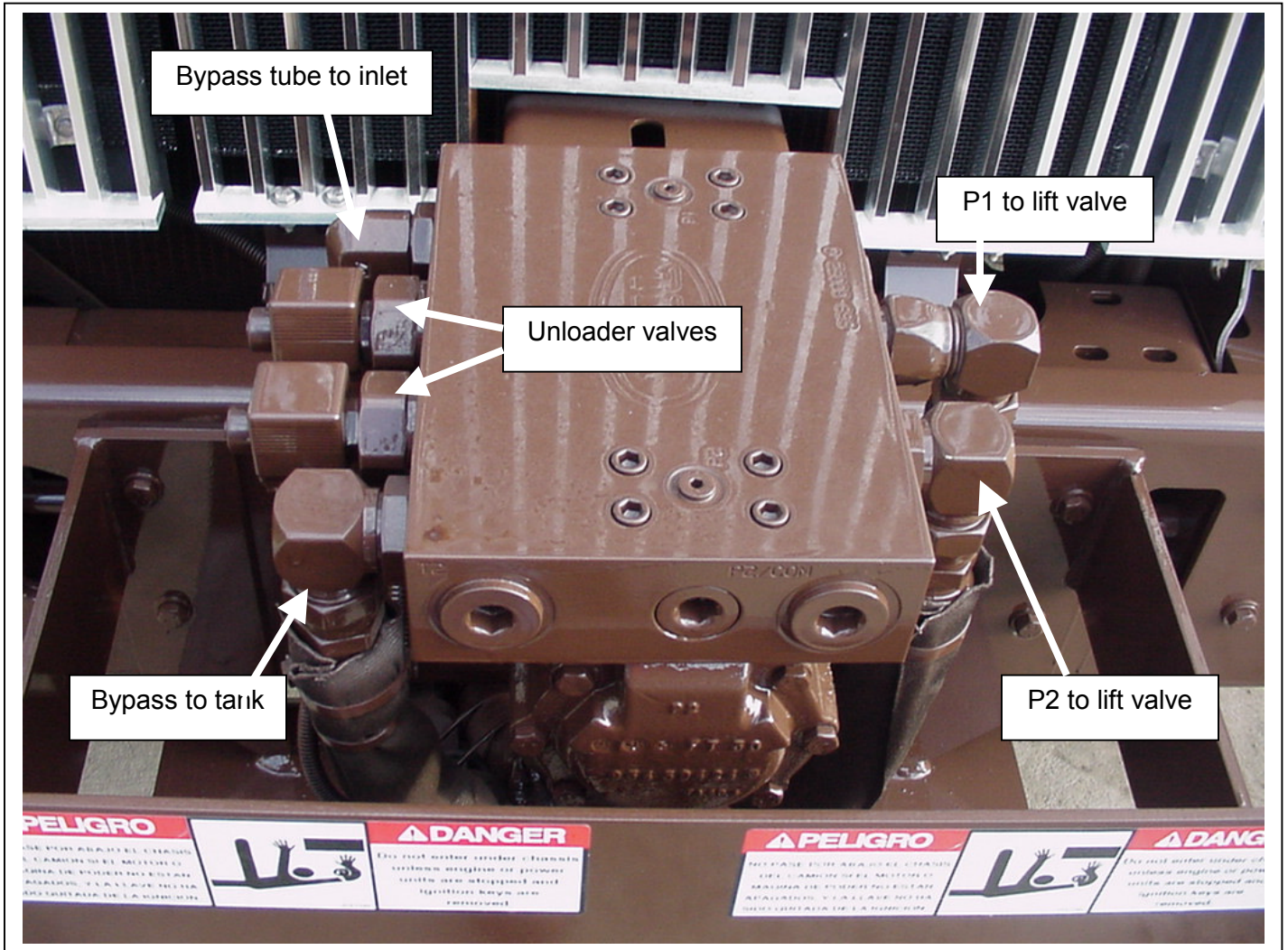
Tandem Vane Pump with Oasis Monoblock (Rapid Rail / Starr)



This is the Oasis Mono Block Operate In Gear At Idle Hydraulic system. The pump section (Pump 1) closest to the input shaft operates the lift and shuts off first. The pump section (Pump 2) farthest from the input shaft operates the packer and stays on at higher RPMs.

Tandem Vane Pump with Oasis Monoblock (Python and 7000)

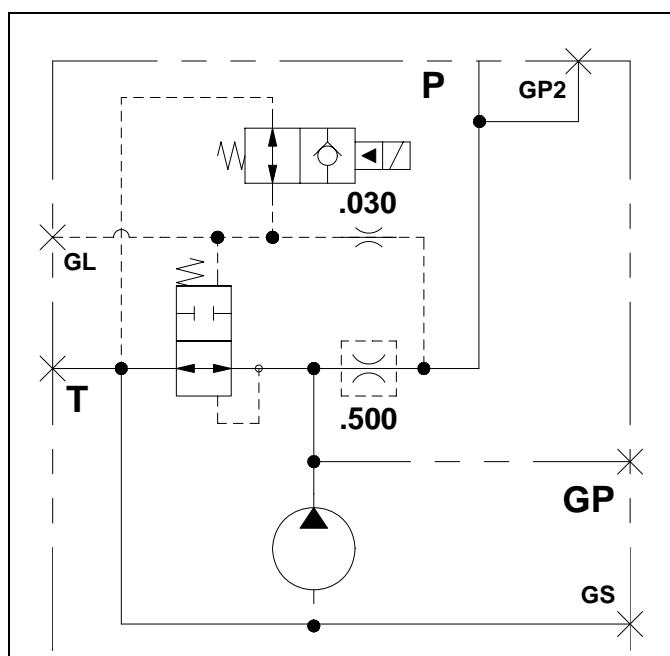
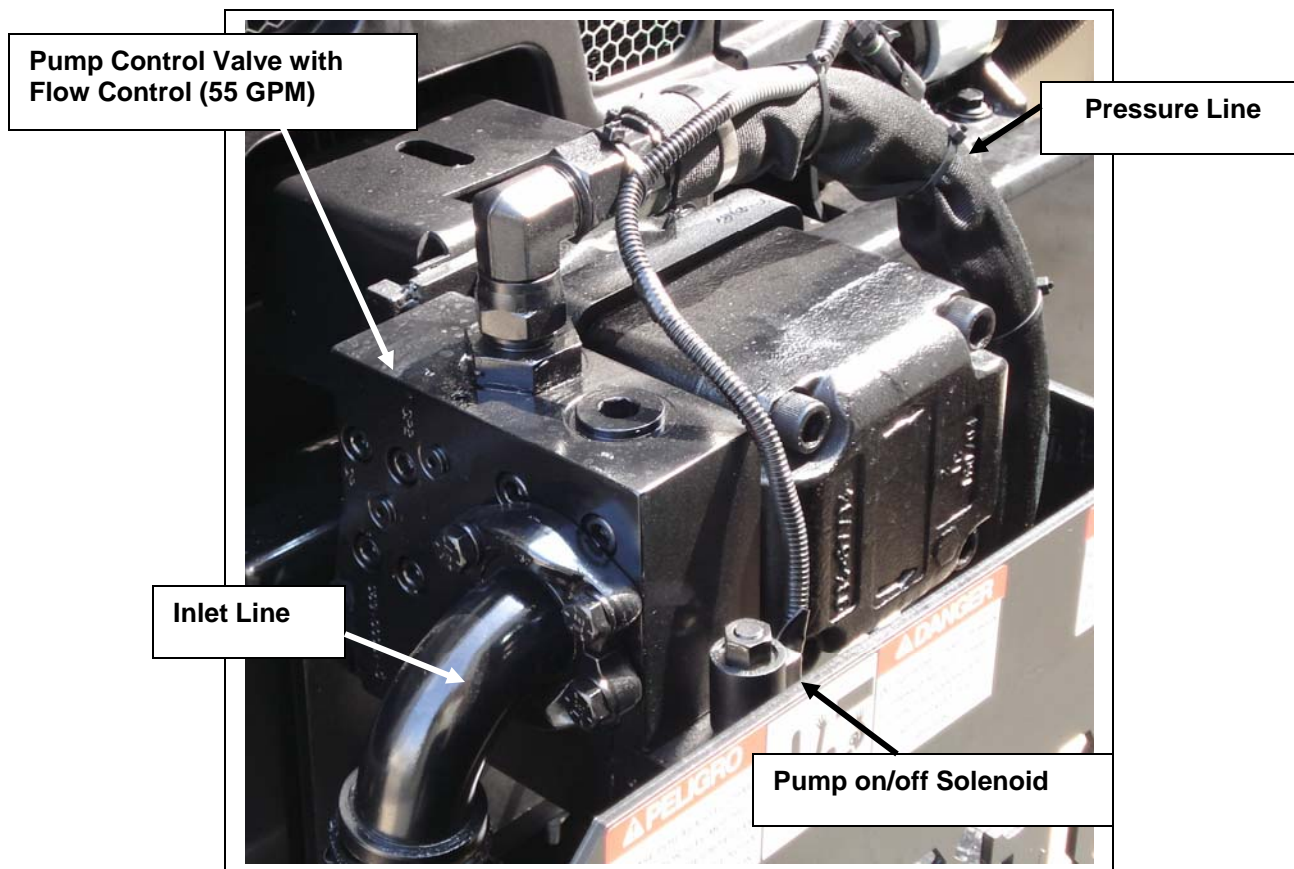
3.14.4



DENISON TANDEM with MONOBLOCK - 7000/PYTHON

This is the Oasis Monoblock Operate In Gear At Idle Hydraulic system. The pump section (Pump 1) closest to the input shaft shuts off first at a lower RPM. The pump section (Pump 2) farthest from the input shaft operates the packer and stays on at higher RPMs.

Denison Single Vane Pump with Control Manifold



The Denison single vane pump control valve is designed to limit the flow to 55 GPM. Excess flow will be recirculated to the inlet.

The Pump on /off valve must have power to turn the pump on.

When the pump solenoid is in the off mode oil is allowed to circulate back to the inlet.

The maximum pump speed is controlled by the PCL.

3.14.5.1

Denison Single Pump Repair Procedures (219-2303)

Use the following procedures to field repair and inspect a 219-2303 single vane Denison pump. The procedure was performed on an Auto-car chassis and can be used on a Mack chassis.

Before making adjustments, make sure the unit is in the lock-out position. LOCK-OUT position is defined as follows:

1. Engine stopped and ignition key removed.
2. Set the brakes and make sure they are holding.
3. Chock all wheels.
4. Insert a LOCK-OUT tag on the steering wheel.

Tools needed to replace the pump include the following:

- 1 1/2 inch open end boxed end wrench
- 3/4 inch open end boxed end wrench
- Wire cutters {Dikes}
- 1/2 inch drive ratchet
- 14mm 1/2 inch drive hex head socket
- 3/8 inch hex head wrench
- 5/32 inch hex head wrench
- Torque wrench capable of producing 150 ft lbs



Tools Required

NOTE: Test the cartridge for damage by flow testing the pump before disassembly.

1. Remove the zip tie from the oil shut-off valve on the hydraulic oil tank. (Figure 1)
2. Turn the shut-off valve to the OFF position. (Figure 2).

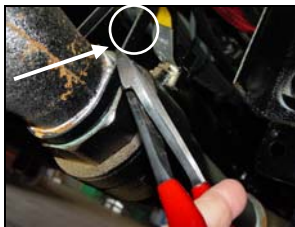


Figure 1 Cut zip tie

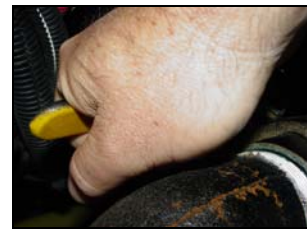


Figure 2 Turn off shut-off valve

3. Remove the grill from the chassis. (Figure 3) The number of bolts for the grill varies with chassis brand.
4. Cut the zip tie around the electrical wiring that controls the pump shut-off valve solenoid. (Figure 4)



Figure 3 Remove grill



Figure 4 Cut zip tie around wiring

5. Disconnect the electrical wiring—the two-way Packard plug—that controls the pump shut-off valve solenoid. (Figure 5)



Figure 5 Disconnect wiring

6. Remove the one-inch hydraulic pressure hose. (Figure 6)

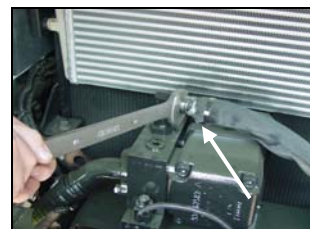


Figure 6 Remove hydraulic pressure hose

7. Remove the four suction line flange bolts. (Figure 7)



Figure 7 Remove flange bolts

8. Remove the eight bolts connecting the pump shut-off valve to the 219-2303 Denison pump. (Figure 8) There are four small bolts and four large bolts.



Figure 8 Remove bolts from shut-off valve

9. Carefully, remove the shut-off valve from the pump. (Figure 9)



Figure 9 Remove shut-off valve

10. Remove the four pump housing connecting bolts. (Figure 10)

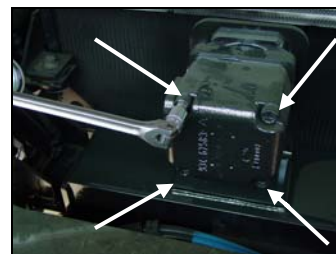


Figure 10 Remove housing connecting bolts

11. Carefully remove the pump case housing. (Figure 11)



Figure 11 Remove housing

12. Remove the pump cartridge by pulling it toward you. (Figure 12) The fit may be tight.



Figure 12 Remove pump cartridge

3.14.5.3

13. Inspect the pump shaft, spines, and bearings for wear and damage. (Figures 13 and 14) Check for the following:
- Sheared or worn shaft splines.
 - Broken bearing



Figure 13 Inspect parts



Figure 14 Inspect parts

14. Inspect the brass bushing on the pump cartridge for wear and damage. (Figure 15)

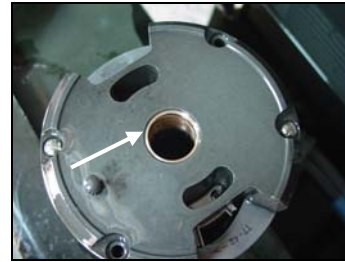


Figure 15 Inspect brass bushing

15. Check the outer housing O-ring for wear or damage such as nicks, fraying, or cuts. (Figure 16) Replace the o-ring if it is damaged.

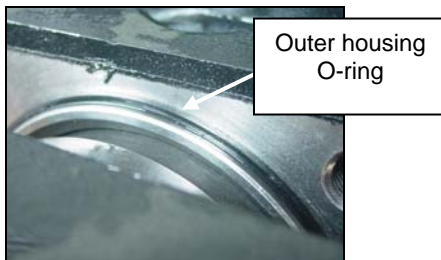


Figure 16 Check O-ring

16. Place the pump cartridge back on the pump shaft. (Figure 17)



Figure 17 install pump cartridge

17. Replace the outer pump housing and finger-tighten the four pump housing bolts. (Figure 18)



Figure 18 Replace outer housing and bolts

18. Tighten the four outer housing bolts to 138#. (Figure 19)



Figure 19 Torque housing bolts to 138 ft lbs

19. Install the new pump shut-off valve using the new bolts included with the new valve. (Figure 20)



Figure 20 Install new shut-off valve

20. Tighten the eight pump shut-off valve bolts as follows: (Figure 21)

- Four small back bolts – 60#
- Four large front bolts – 92#



Figure 21 Torque shut-off valves

21. Install the suction line flange to the pump shut-off valve and tighten the four bolts on the flange. (Figure 22)



Figure 22 Replace suction line

22. Install one straight connector, 054-3341-10, to the **P Port** on the shut-off valve. (Figure 23)



Figure 23 Install straight connector

23. Install one 90 degree elbow, 054-2988-10, on the straight connector. (Figure 24)

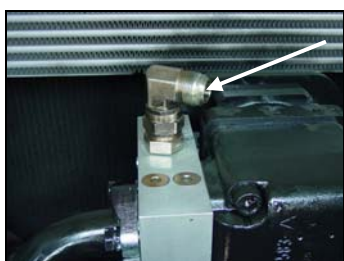


Figure 24 Install 90 degree elbow

24. Connect the one inch hydraulic pressure hose to the 90 degree elbow. (Figure 25)



Figure 25 Reconnect hydraulic pressure hose

25. Install the following two-way Packard connector to the two wires coming from the solenoid on the new shut-off valve: (Figure 26)
- 1 ea – 108-4827-004 Two-way female connection
 - 2 ea – 108-4827-120 Female terminal (18-20AWG)
 - 2 ea – 108-4827-132 Cable seal (16-14 GA)



Figure 26 Install two-way Packard connector

26. Connect the new Packard connector to the original, matching Packard connector. Secure the excess wiring harness for the solenoid to the hydraulic pressure line with a zip tie. (Figure 27)



Figure 27 Connect plugs and secure excess wiring

27. Attach the grill to the chassis. (Figure 28)



Figure 28 Reattach grill

28. On the hydraulic oil pump, move the shut-off valve to the open position and secure the valve with a zip tie. (Figure 29 and 30)

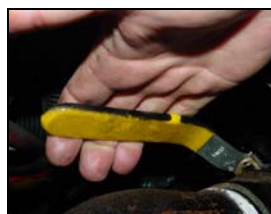


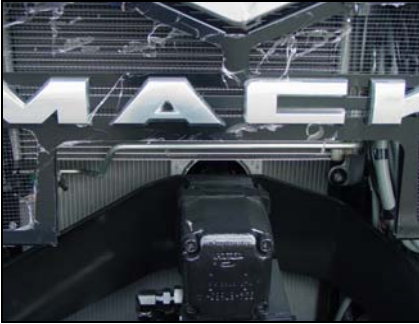
Figure 30 Secure valve



Figure 29 Open valve

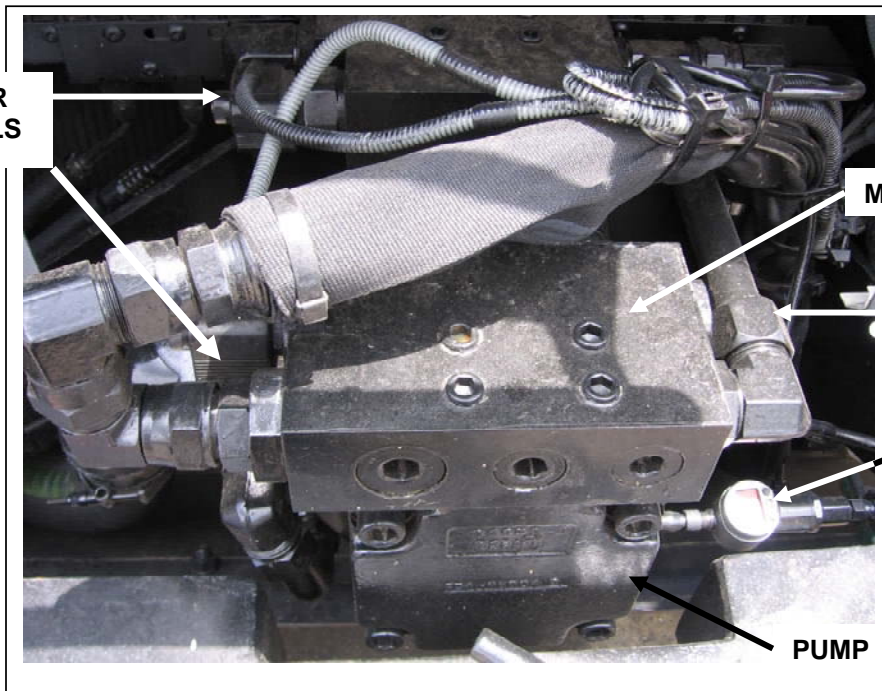
3.14.5.5

The following pictures show the 219-2303 pump configuration installed on a Mack Chassis.



DENISON TANDEM VANE PUMP FRONT LOADER O-A-I OPERATION – PROGRAM 109-0229

**UNLOADER
VALVE COILS**

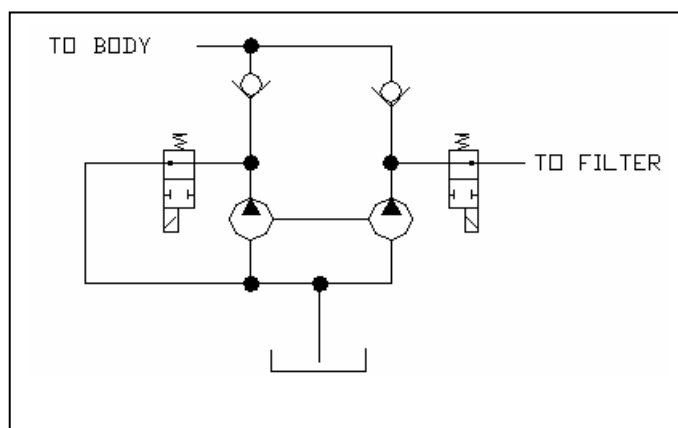


MANIFOLD

**PRESSURE
LINE**

**ELECTRONIC
PRESSURE
GAUGE**

PUMP



This is a high flow Denison tandem pump set up with the Oasis pressure manifolds. This system combines the flow of oil from both pumping sections to get normal cycle times for the packer and body functions at engine idle.

The pumping section closest to the pump input shaft (P1) shuts off first during higher RPM's. The pumping section farthest from the pump input shaft (P2) stays on longer during higher engine RPM's. The packer cycle time for units using this pump set up is fastest during engine idle up to 1050 RPM.

The Oasis pressure block manifolds contain two unloader valve and coil assemblies used to activate each respective pumping section and control the flow of oil directed to the hydraulic system.

Front Loader OAI Pump Operation for Program 109-0229 as documented on August 1st 2007

The front loader operate at idle (OAI) pump system uses a Denison tandem vane pump with a 50 GPM size cam ring in the P1 front section (closest to input shaft) and a 38 GPM in the P2 back section (farthest from input shaft). The PLC program, electronic pressure switch, electrical wiring, and hydraulic plumbing are all critical and must be exact for this system to function properly.

This hydraulic system should produce the most flow and have the fastest cycle times at idle up to 1050 RPM. The system is designed to operate all hydraulic functions at idle.

PLC Program 109-0229

Utilizes input 01.02 to monitor the on / off status of the electronic pressure switch. The input should be on during low pressure and shut off when the hydraulic system reaches the high pressure setting of the electronic pressure switch.

Utilizes output 10.05 for P1 (50 GPM pump closest to input shaft) to shut off at 1050 RPM.

Utilizes output 11.06 for P2 (38 GPM pump farthest from input shaft) to shut off at 2100 RPM or when the high pressure setting of the pressure switch is reached.

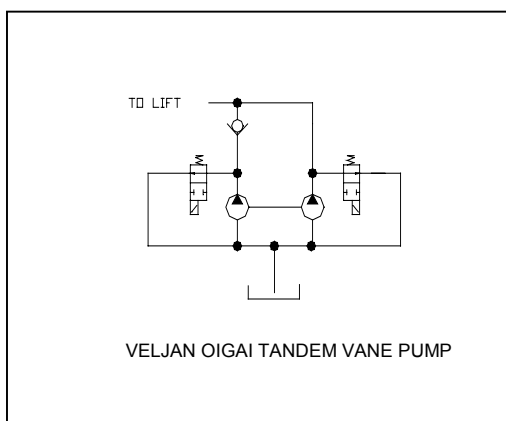
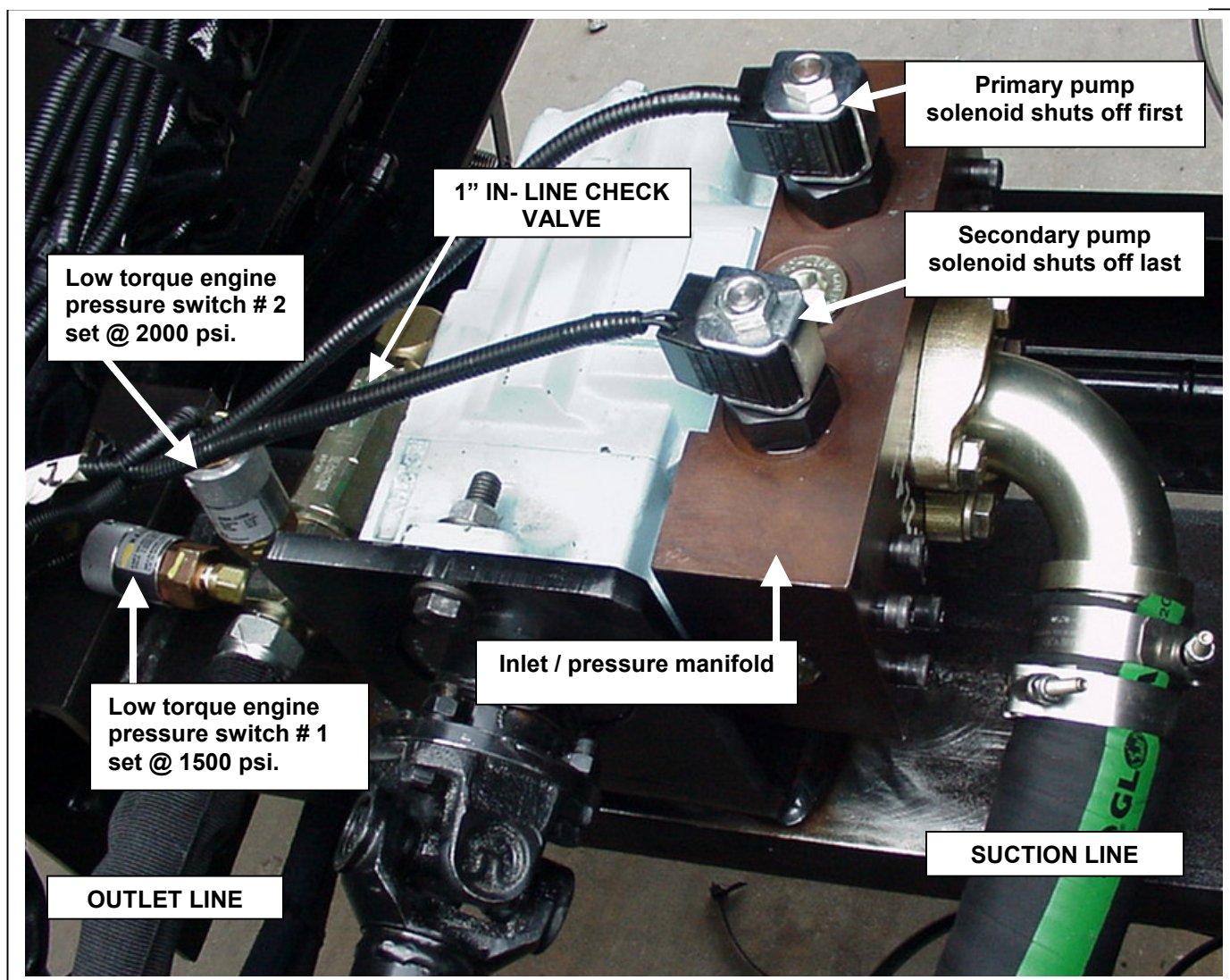
Electronic Pressure Switch

This switch is used to prevent the engine from stalling when using the front loader body functions during engine idle. Some engines do not produce enough net torque at idle and will stall while using some of the hydraulics functions. The pressure switch is used to shut off the P2 (38 GPM pump farthest from input shaft) just before the engine stalls. This setting (SP1) is generally around 2000 psi. but can be customized to accommodate the particular engine characteristics for each individual machine.

The hysteresis setting (HYS1) is generally set at 700 psi. This is the pressure that is subtracted from SP1 that tells the pump to turn on again. Example: pump shuts off at 2000 psi and turns back on at 1300 psi. when you set the Hysteresis to 700 psi. A hysteresis setting that is too low may cause hydraulic system chatter.

The electronic pressure switch must be plumbed into the main pressure circuit at the hydraulic pump pressure block to work properly. We need to shut the smaller P2 (38 GPM pump farthest from input shaft) off at idle to prevent engine stall. A pressure switch that is plumbed or wired incorrectly may cause hydraulic system chatter.

VELJAN TANDEM VANE HYDRAULIC PUMP



The Veljan tandem vane pump uses a common manifold for the inlet and outlet ports. Both sections of the tandem pump are unloaded internally back to the inlet side of the pump. The section farthest from the input shaft is the primary section and shuts off first.

DENISON TANDEM VANE PUMP with Hydraulic Controls Pressure Blocks OR Oasis Pressure Blocks OPERATE IN GEAR AT IDLE HYDRAULIC SYSTEM TROUBLESHOOTING

DESCRIPTION

The Operate in Gear system is designed to perform the side loading operations at standard idle speed. It is comprised of two major components, the Denison T6CC series vane pump and attached unloader valve assemblies.

On Rapid Rail systems the P1 or front section (closest to the pump input shaft) operates the loader section of the truck while the P2 or rear section (farthest from the input shaft) operates the body section, which includes the packer. On F7000 series units the flows from both pump sections are combined to run the lift (loader) then exit the lift valve to operate the body valve.

The unloader valve assemblies consist of a manifold (pressure) block, a normally open cartridge valve and a 12VDC-solenoid coil. In the operation mode, current is supplied to the valve coil, causing the valve to close, allowing pump flow to the respective hydraulic circuit. In the bypass mode, the coil is de-energized causing the valve to open, allowing the oil to re-circulate either back to tank or to the pump inlet.

TROUBLESHOOTING

The symptoms of a problem in the pump circuit are no operation or slow operation of the loader or packer system. Since the 7000 series uses combined flows, a common symptom of system malfunction in the 7000 is the packer operating at half the normal speed. On a 7000 series body with a Rapid Rail lift, each pump section controls one aspect of the system independent of the other. A malfunction of one pumps section will normally only affect one function of the truck. For example the packer will work correctly but not the loader or vice versa.

There are three primary causes for the pump circuit not to operate properly:

- 1) Low or no voltage to the unloader valve coil
- 2) Malfunction in the unloader valve assembly
- 3) Internal problem with the pump

The following test is to be performed after determining there is insufficient or no flow to the loader and/or body valves.

1) CHECK THE ELECTRICAL SUPPLY TO THE UNLOADER VALVE COILS

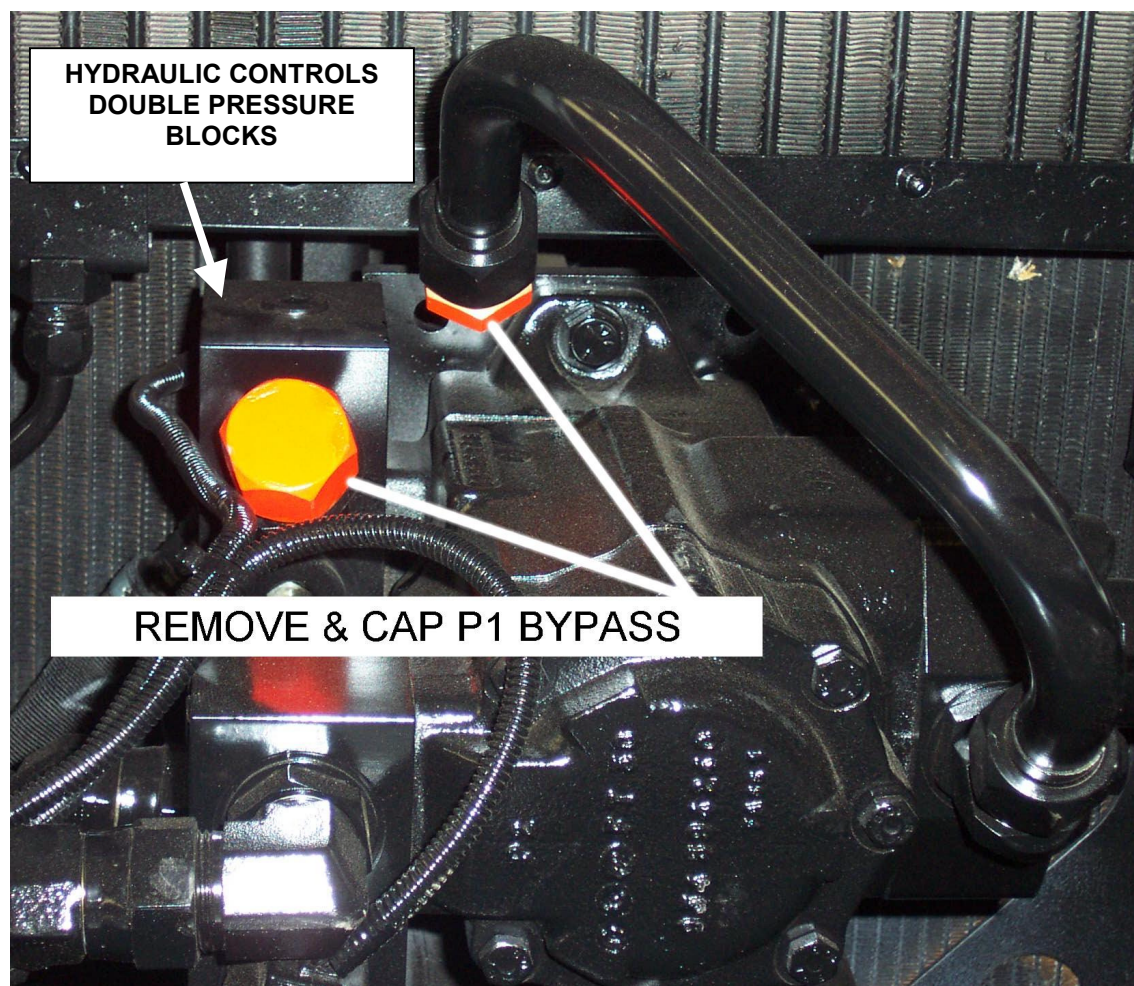
With the system turned on and the engine operating at idle, test the voltage at the coil. It should read a minimum of 10 VDC. If proper voltage is present and problem persists, proceed to step 2. If the voltage is below 10, check the electrical system for problems that would cause a drop or loss of voltage to the unloader valve solenoid coil. Some examples would be a broken or shorted wire, blown fuse, fault in the side door switch (if equipped), no alternator input or a failed or improperly set RPM driver card or PLC.

**DENISON TANDEM VANE PUMP with Hydraulic Controls Pressure Blocks,
Oasis Double Pressure Blocks, or Oasis Monoblock
OPERATE IN GEAR AT IDLE HYDRAULIC SYSTEM TROUBLESHOOTING**

2) ELIMINATE THE UNLOADER VALVE FROM THE CIRCUIT

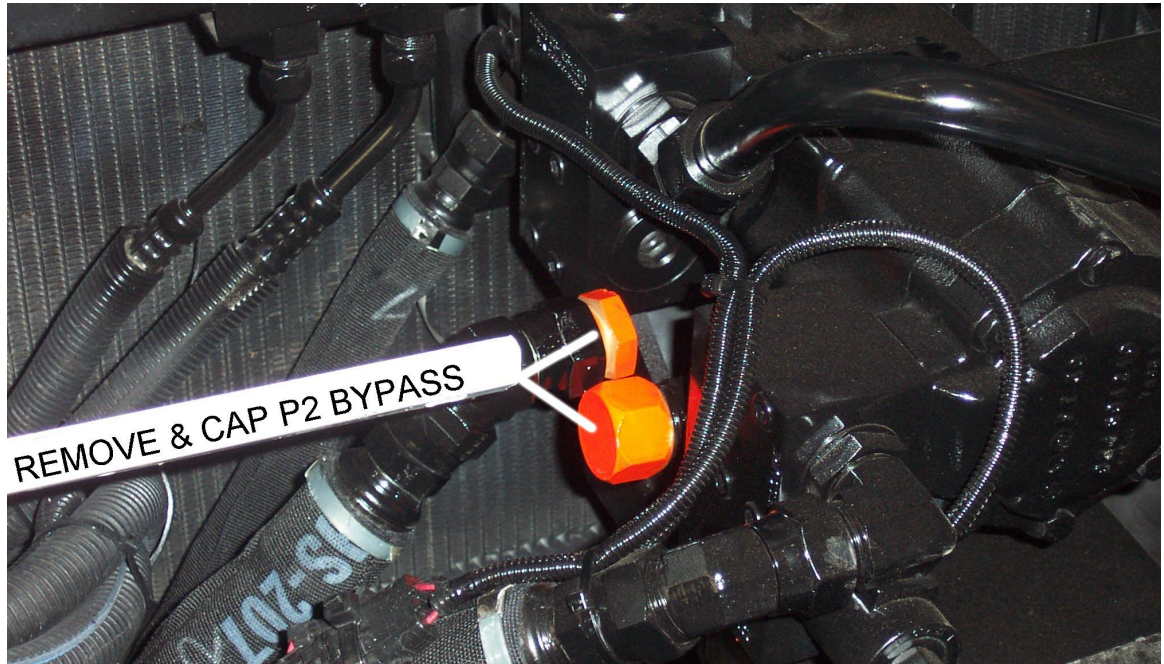
With the engine shut down, remove the bypass line from the pressure block port marked “bypass”. Install a #16 JIC plug into the line and a #16 JIC cap on the fitting at the “bypass” port. Restart the truck and test the functions. If the lift and packer functions return to normal operation (speed and pressure within specifications), replace the unloader assembly.

note: If flow is present and lift or packer operates but only under no load, check the main relief valves for proper adjustment and operation.



CHECKING UNLOADER VALVE PUMP 1

**DENISON TANDEM VANE PUMP with Hydraulic Controls Double Pressure Blocks,
Oasis Double Pressure Blocks, or Oasis Monoblock
OPERATE IN GEAR AT IDLE HYDRAULIC SYSTEM TROUBLESHOOTING**

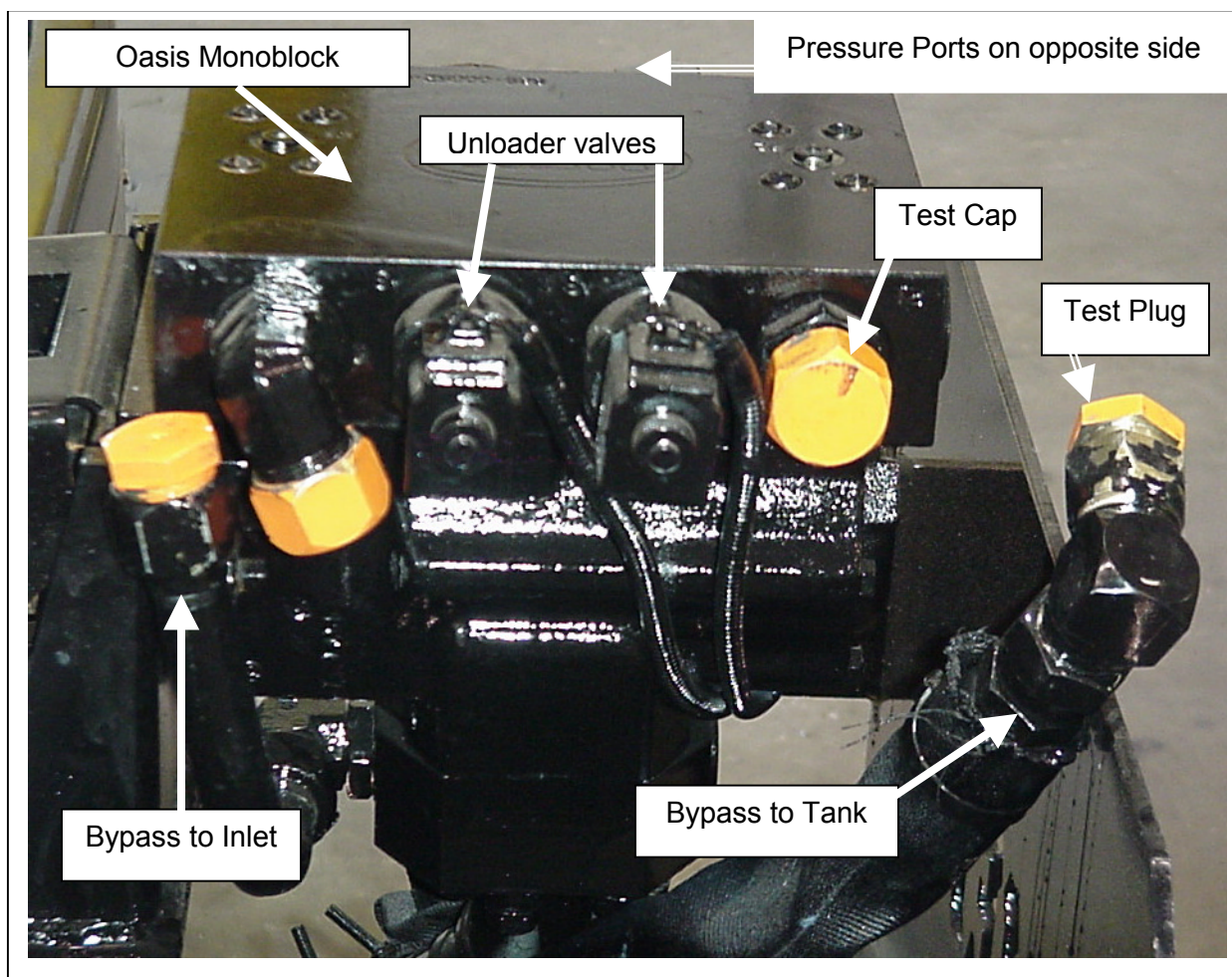


CHECKING UNLOADER VALVE PUMP 2

3) REPLACE PUMP ASSEMBLY

If problem still persists, an internal failure of the pump is indicated. Replace the pump assembly. If the pump is a remote mount type (drive shaft driven), care must be taken to maintain correct "phasing" of the drive shaft. Phasing is the exact alignment of the drive shaft universal joints. A drive shaft out of phase will cause rapid internal damage to the pump. If the drive shaft is separated during removal of the pump, it must be put back together with the splines in the same location when it was separated. If the drive shaft must be separated, make alignment match marks at the spline area and reassemble with the match marks aligned.

DENISON PUMP TROUBLESHOOTING



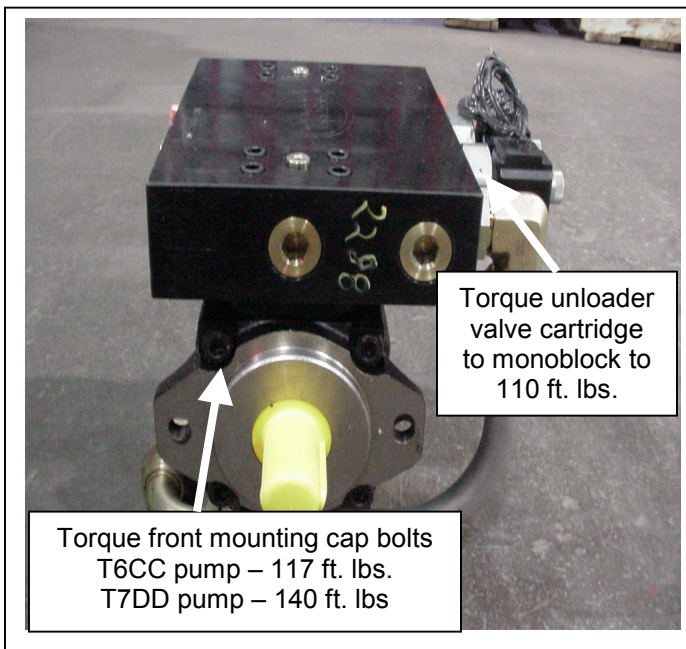
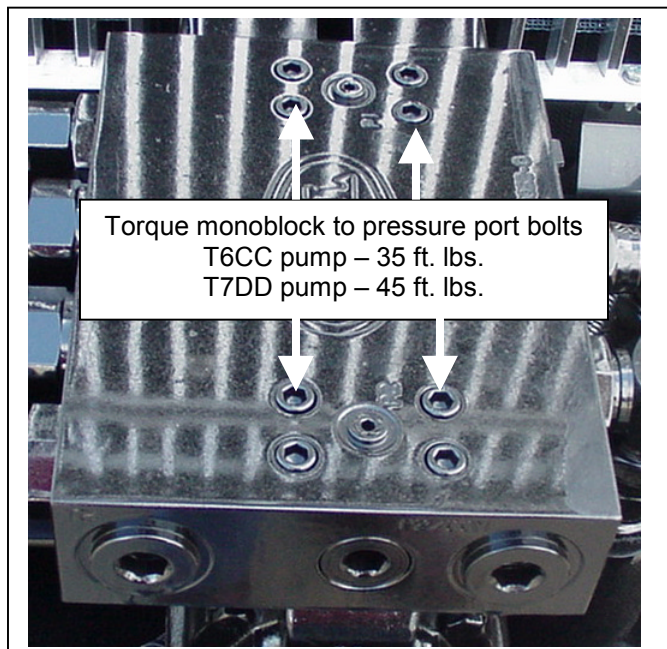
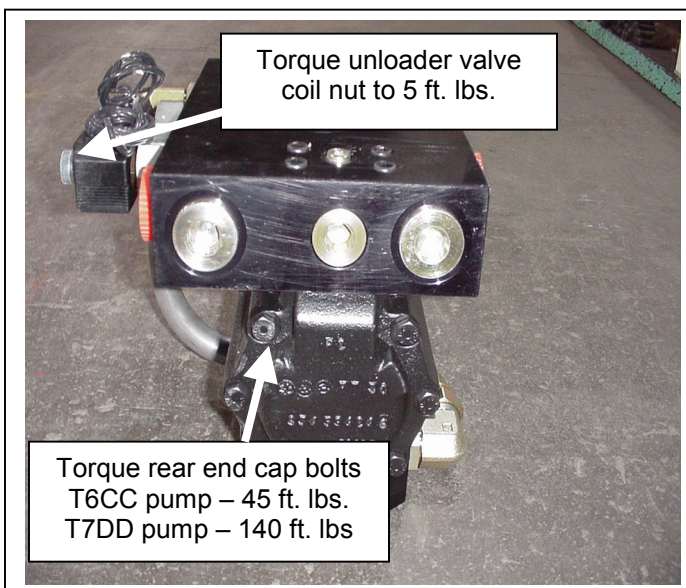
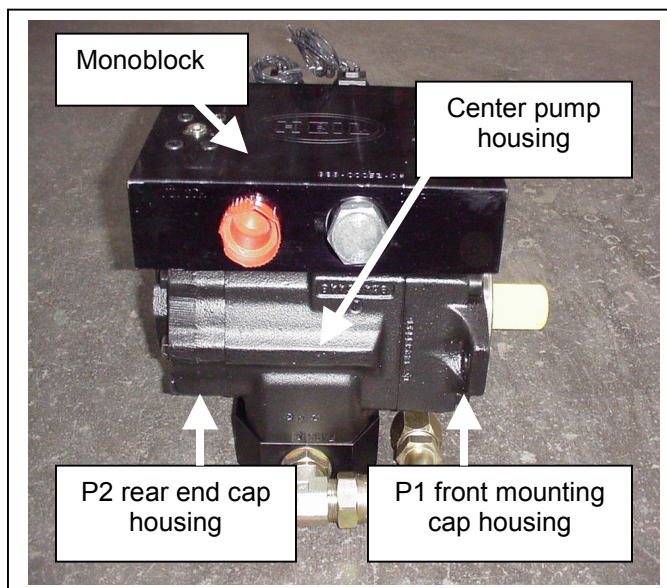
Troubleshooting Tandem Vane Pump Pressure Manifolds - This Procedure Covers Hydraulic Controls Double Block Configuration, Oasis Double Block Configuration, and Oasis Monoblock Configuration

On front mount tandem vane pump applications the pump is always rotating and always producing flow. When the hydraulic system is activated (Pump ON) the unloader valves block or close off the bypass ports back to inlet and back to tank. Before a pump can be determined to be faulty you must first eliminate the possibility of a defective unloader valve. Simulating the function of the unloader valves can be accomplished by capping and plugging the bypass ports and hoses. With the pumps activated the unloader valve blocks the bypass ports so all of the pump flow is directed to the hydraulic circuit. If an unloader valves are not completely blocking off the bypass ports some or all of the pump flow will be lost through the bypass port and result in a slow hydraulic system.

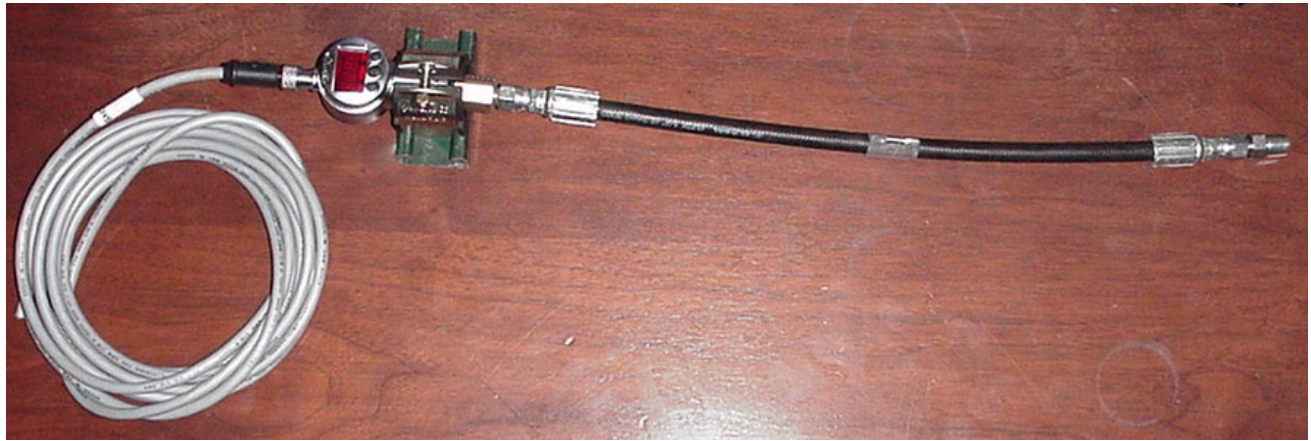
MOUNTING OF OASIS PUMP MONOBLOCK TO TANDEM PUMP

Follow these steps when mounting a monoblock to the Denison tandem pump.

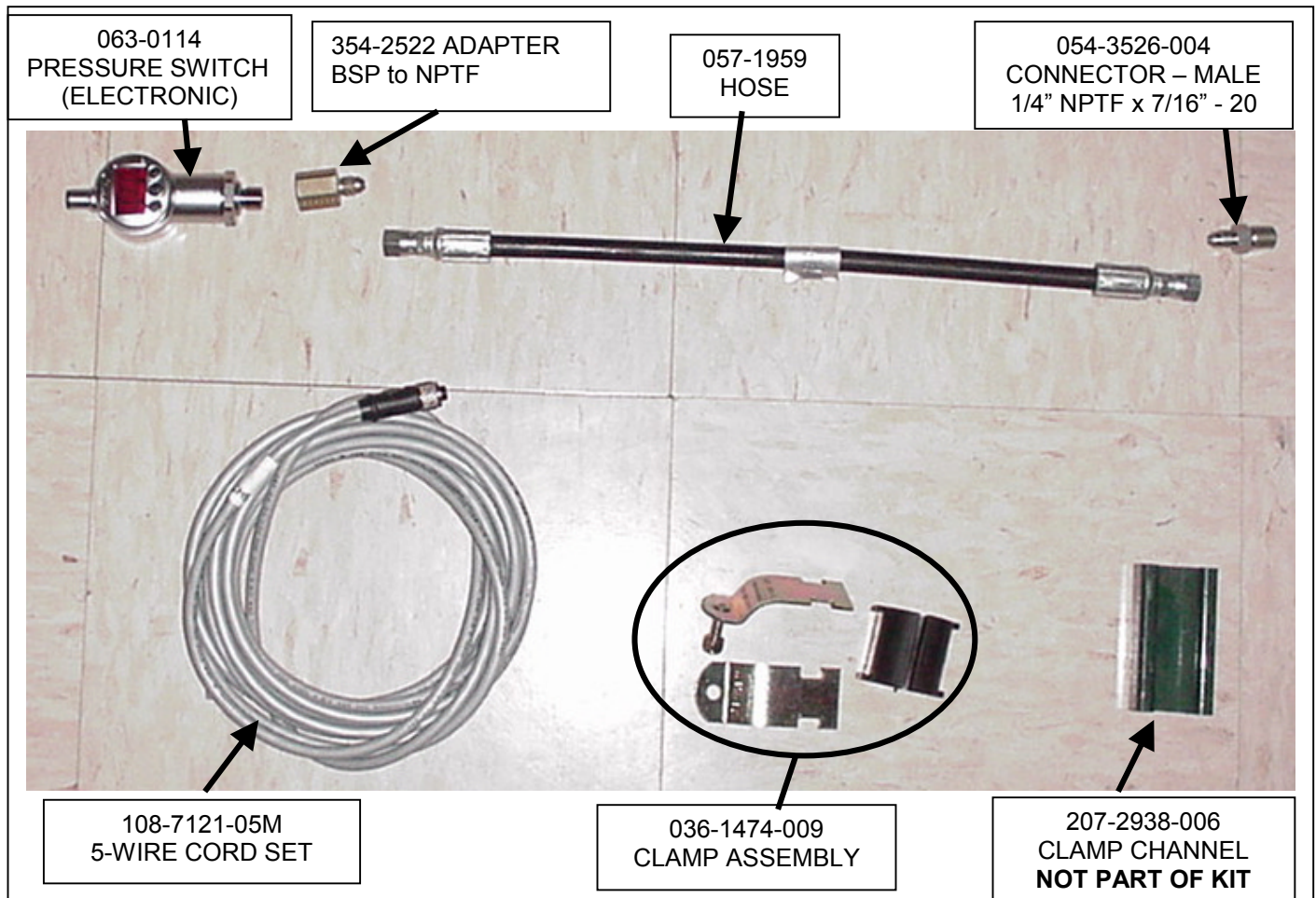
1. Loosen the rear end cap bolts and front mounting cap bolts to allow slight movement between the P1, center pump, and P2 housings. This is done to provide the P1 and P2 pressure ports to align parallel to the monoblock.
2. Mount the monoblock with the eight (8) cap screws with hi-collar lock washers and torque the cap screws.
NOTE: Make sure the o-rings stays in place.
3. Retorque the bolts on the rear end cap and front mounting cap housings of the pump.
4. If either the unloader valve cartridge or the pilot valve cartridge (that screw into the unloader valve cartridge) has been removed, they will need to be re-torqued. Re-torque the unloader cartridge to 110 ft. lbs. and the pilot cartridge (not shown) to 15 ft. lbs.



LOW TORQUE ENGINE ELECTRONIC PRESSURE SWITCH KIT 372-2260



The optional electronic pressure switch kit is used on low torque engine applications with O-I-G-A-I tandem vane pump to prevent engine stall during high torque demands.

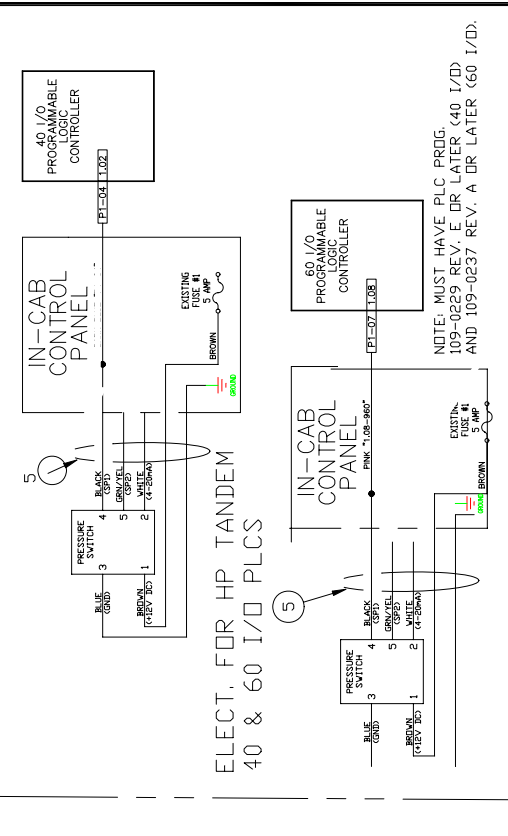
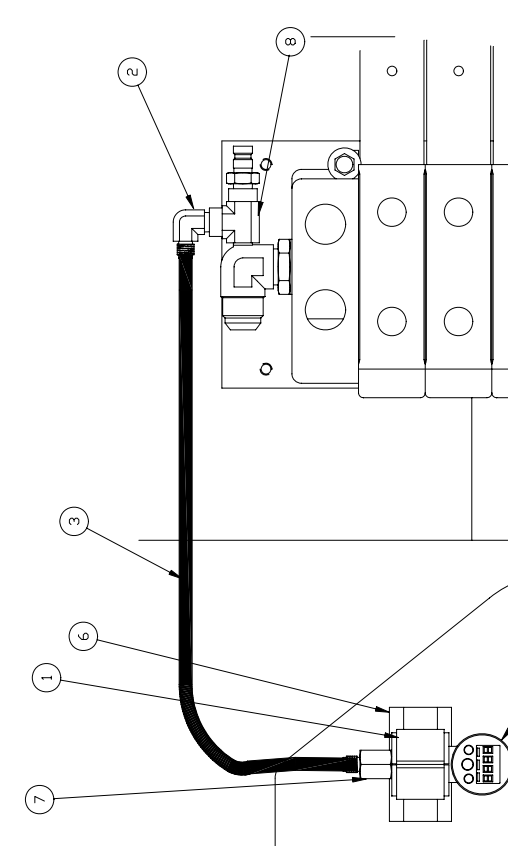


IN-CAB
CONTROL
PANEL

40 I/O
PROGRAMMABLE
LOGIC
CONTROLLER

DATE: "UE 71-06"

PI-06 00.06



NOTE: MUST HAVE PLC PROG.
109-0229 REV. E OR LATER (40 I/O)
AND 109-0237 REV. A OR LATER (60 I/O).

NOTE: THIS KIT PROGRAMS:

1. DISENGAGING OF PUMP#1 WHEN SYSTEM PRESSURE REACHES THE PROGRAMMED PRESSURE SET POINT.
2. RE-ENGAGING OF PUMP#1 WHEN THE SYSTEM PRESSURE DROPS BELOW THE PROGRAMMED HYSTERESIS SET POINT.

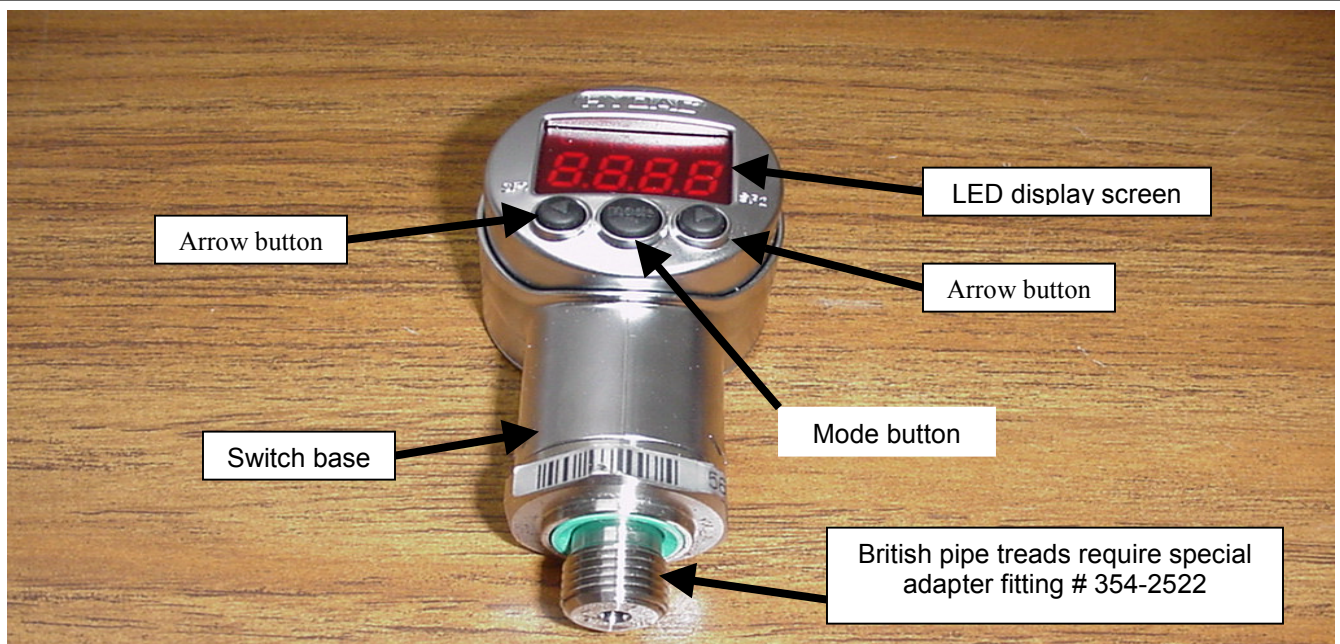
1. PRESS MODE BUTTON DURING POWER UP AND HOLD FOR 3 SECONDS UNTIL "H51" IS DISPLAYED.
2. PRESS RELEASE MODE BUTTON UNTIL "H4B" IS DISPLAYED. USE ARROW BUTTON TO SET TO "PSI". (THIS SETTING CHANGES THE PRESSURE SWITCH TO READ IN PSI, DEFAULT IS BAR)
3. PRESS RELEASE MODE BUTTON UNTIL "H4D" IS DISPLAYED. USE ARROW BUTTONS TO SET TO "PRESS" (PRESSURE, PRESSURE CHANGE)
4. WAIT 3 SECONDS. PRESS MODE BUTTON UNTIL "SP1" IS DISPLAYED. USE ARROW BUTTONS TO SET TO "2000". (THIS SETS SWITCH OUTPUT #1 TO TRIGGER AT 2000PSI)
5. PRESS AND RELEASE MODE BUTTON UNTIL "H51" IS DISPLAYED. USE ARROW BUTTONS TO SET TO "700". (THIS SETS THE HYSTERESIS TO KEEP THE SWITCH TRIGGER UNTIL THE PRESSURE DROPS 700PSI BELOW THE VALUE IN SP1)
6. VERIFY OPERATION OF THE UNIT, IF THE ENGINE CONTINUES TO STALL DECREASE THE "SP1" SET POINT IN INCREMENTS OF 100 UNTIL ENGINE NO LONGER STALLS.
7. VERIFY THAT THE PACKER PUMP DOES NOT DISENGAGE AND RENGAGE MULTIPLE TIMES WITH EACH PRESSURE SWITCH ACTIVATION. IF THIS DOES OCCUR DECREASE THE "H51" SET POINT IN 100 PSI INCREMENTS UNTIL OCCURRENCES STOP.

254-4548-005

Electronic Pressure Switch

Part Number 063-0114

3.19.1.1



The base of the switch and LED display screen can both be rotated in position for easy to read access. The switch load contacts are rated @1.2 amps. A relay or other switching device must be used in applications requiring a high current demand. This switch has internal snubber characteristics and will not except external snubber valve.

NOTE: During mounting the switch should be positioned or shielded so it has maximum protection against the elements of weather, falling debris, and road debris.

The electronic pressure switch is very versatile and can be used in any Heil pressure switch application. It is typically used in a low torque engine with a tandem pump application to prevent engine stall at low RPM. The electronic pressure switch can be programmed to shut off one of the tandem pumps when a predetermined system pressure is reached.

Note: **Hysteresis value** referenced below = pump kick out set point - pump kick on set point.

Example: 500 psi. hysteresis value = 2000 psi. kick out – 1500 psi. kick on

Steps 1 through 3 of the setup procedures below are only used during the initial switch set up. These steps should be ignored when a set point is being changed after the initial setup of the switch has already been completed.

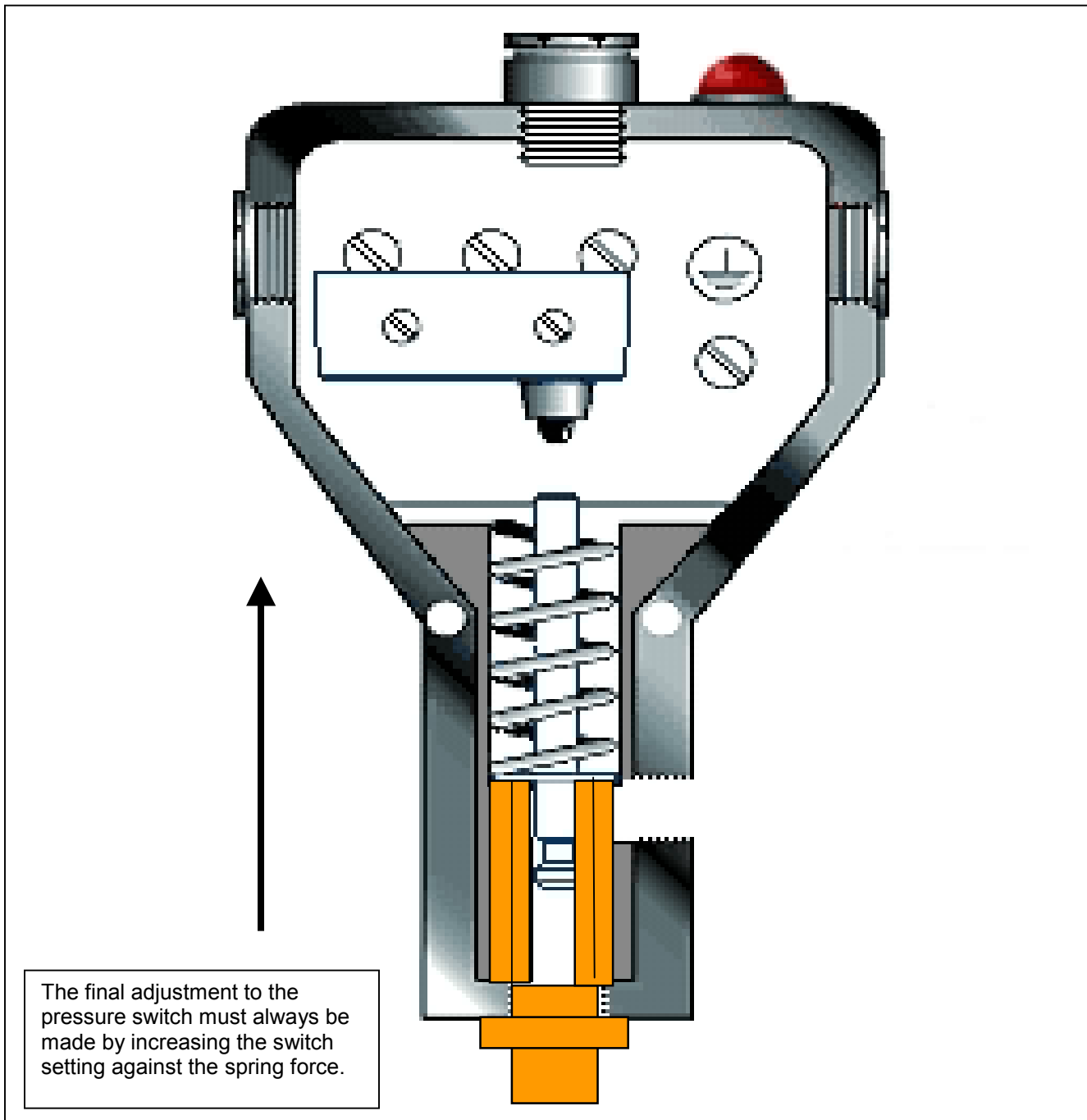
NOTE: THIS KIT PROVIDES:

1. DISENGAGING OF PUMP#1 WHEN SYSTEM PRESSURE REACHES THE PROGRAMMED PRESSURE SET POINT.
2. REENGAGING OF PUMP#1 WHEN THE SYSTEM PRESSURE DROPS BELOW THE PROGRAMMED HYSTERESIS SET POINT.

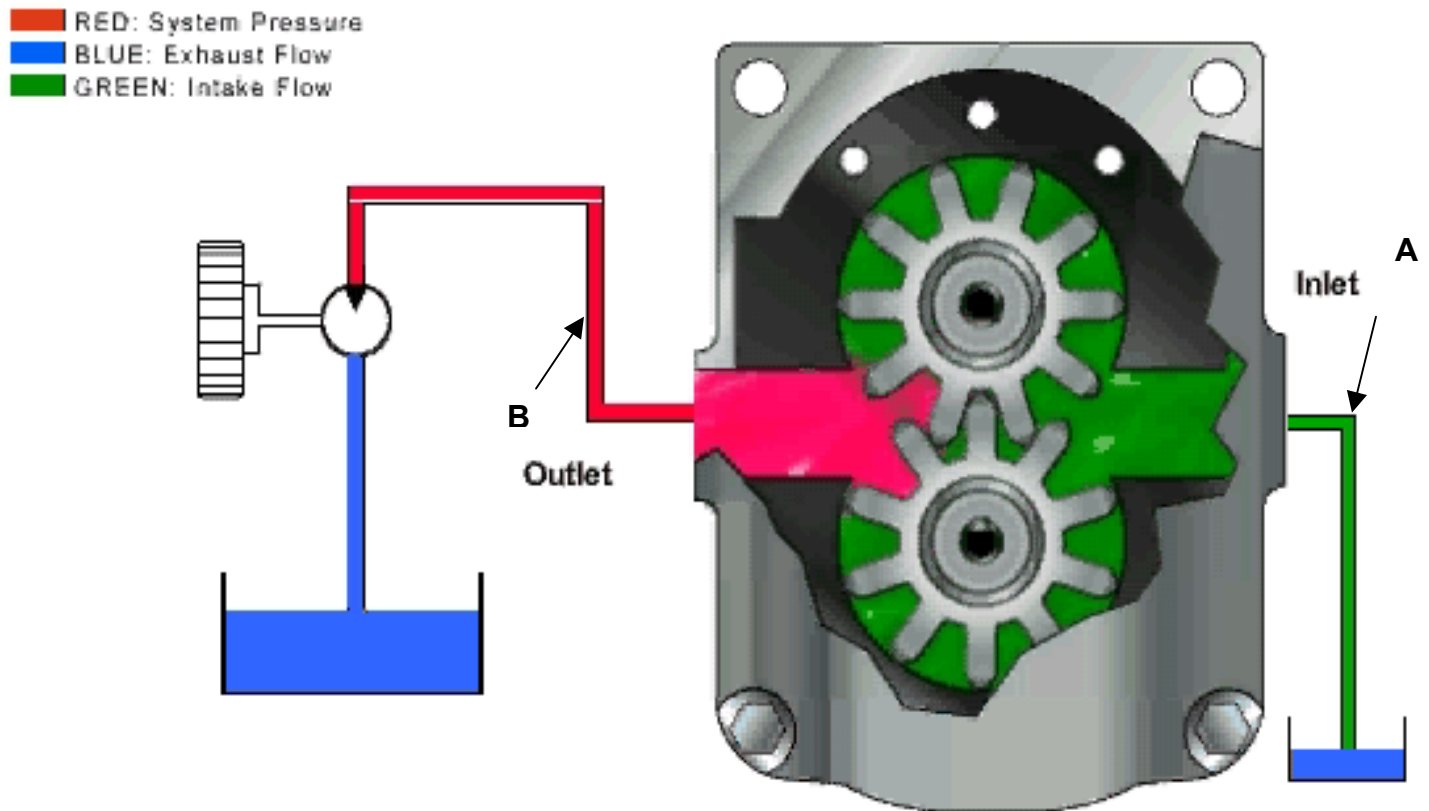
SETUP PROCEDURE

1. PRESS MODE BUTTON DURING POWER UP AND HOLD FOR 3 SECONDS UNTIL "Menu" IS DISPLAYED.
2. PRESS AND RELEASE MODE BUTTON UNTIL "rAng" IS DISPLAYED. USE ARROW BUTTON TO SET TO "PSI". (THIS SETTING CHANGES THE PRESSURE SWITCH TO READ IN PSI, DEFAULT IS BAR)
3. PRESS AND RELEASE MODE BUTTON UNTIL "End" IS DISPLAYED. USE ARROW BUTTONS TO SET TO "YES". (THIS STORES THE PROGRAM CHANGE)
4. WAIT 3 SECONDS, PRESS MODE BUTTON UNTIL "SP1" IS DISPLAYED. USE ARROW BUTTONS TO SET TO "2000". (THIS SETS SWITCH OUTPUT #1 TO TRIGGER AT 2000PSI).
5. PRESS AND RELEASE MODE BUTTON UNTIL "HYS1" IS DISPLAYED. USE ARROW BUTTONS TO SET TO "700". (THIS SETS THE HYSTERESIS TO KEEP THE SWITCH TRIGGER UNTIL THE PRESSURE DROPS 700PSI BELOW THE VALUE IN SP1).
6. VERIFY OPERATION OF THE UNIT, IF THE ENGINE CONTINUES TO STALL DECREASE THE "SP1" SET POINT IN INCREMENTS OF 100 UNTIL ENGINE NO LONGER STALLS.
7. VERIFY THAT THE PACKER PUMP DOES NOT DISENGAGE AND RENEGAGE MULTIPLE TIMES WITH EACH PRESSURE SWITCH ACTIVATION. IF THIS DOES OCCUR DECREASE THE "HYS1" SET POINT IN 100 PSI INCREMENTS UNTIL OCCURRENCES STOP.

NON ELECTRONIC PRESSURE SWITCH



Dead Band - The change in an input without any measurable change in the output.. Pressure switch dead bands occur due to the resistance caused by the internal spring, piston, and seals. This condition is more prevalent during a decrease in pressure or lowering the pressure switch setting away from the spring force. Therefore the final adjustment to the pressure switch must always be made by increasing the switch setting against the spring force.



Cavitation

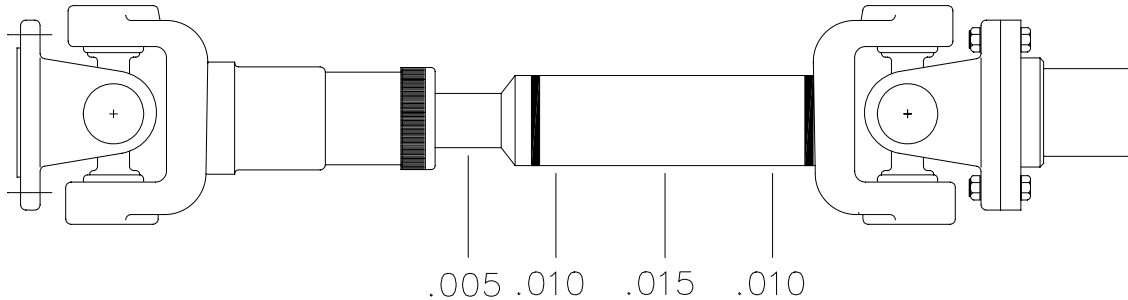
Cavitation is caused by vacuum or the absence of atmospheric pressure that extracts air molecules from the fluid in the form of tiny air bubbles. When these air bubbles see pressure greater than 20 psi. They collapse or implode. Bubbles that implode next to the gear housing or gear surface take metal particles with them causing pitting and pump damage.

General Pump Rules to Prevent Cavitation

1. Inlet vacuum (A) should never exceed more than minus 5 in. of Mercury (Hg) at sea level in the **ON** mode.
2. Standby or neutral pressure (B) should never exceed more than 20 psi. in the **OFF** mode.

DRIVE SHAFT MFG. SPECIFICATIONS:

1) SHAFT TO BE MANUFACTURED PER DANA RUN-OUT SPECIFICATION (SEE BELOW).



- a) 0.005 T.I.R. ON THE NECK OF THE SLIP TUBE SHAFT.
- b) 0.010 T.I.R. ON THE ENDS OF TUBING 3" FROM WELDS.
- c) 0.015 T.I.R. AT LINEAR CENTER OF THE TUBE.
- d) 0.015 T.I.R. FOR FULL LENGTH OF TUBE WITH 30" OR LESS.
(T.I.R.—Total Indicator Reading).

2) SHAFT TO BE BALANCED PER DANA DSIG-3311. SPECIFICATION IS .375 oz-in. TOTAL AT EACH END OF SHAFT.

SECTION 4

CONTROLS

(& Electrical)

SERVICE MANUAL



A  **DOVER** COMPANY

SECTION 4 – CONTROLS/ELECTRICAL

Electrical;

Electrical Symbols and Definitions..... 4.2

Body Electrical Wiring Diagram..... 701-8465

Cab Electrical Wiring Diagram 372-1523

EOS Overspeed Switch and Troubleshooting 4.3 thru 4.5

Alternator “R” Stator Terminal Corrosion Protection..... 4.6

Throttle Advance/Limit Kits;

Pneumatic and Mechanical Throttle Advance..... 4.7

Electronic Controlled Throttle Advance 4.8 thru 4.13

Neutral Switch Kits 4.14 thru 4.20

EOS Electronic Overspeed Kits..... 4.21 thru 4.29

Air Shift Kit 4.30

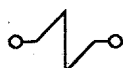
SYMBOL DEFINITIONS



BATTERY



FUSE



SOLENOID



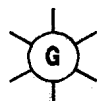
CONTACT RELAY



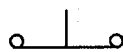
NORMALLY OPEN CONTACT OF CR1



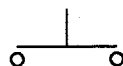
NORMALLY CLOSED CONTACT OF CR1



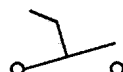
INDICATOR LIGHT (GREEN)



PUSH BUTTON SWITCH NORMALLY CLOSED



PUSH BUTTON SWITCH NORMALLY OPEN



TOGGLE SWITCH



DIODE



PRESSURE SWITCH



LIMIT SWITCH NORMALLY OPEN



LIMIT SWITCH NORMALLY CLOSED



CAPACITOR

OVERSPEED SWITCH

CONNECTING THE VEHICLE WIRING HARNESS

Black — Ground Wire: This wire should be attached to the truck frame. Caution: Body attachments do not always provide good grounds.

Red — Power Input To 108-4545: Connect this line to the output terminal of the on/off switch controlling the clutch or PTO.

Green — Power Output From 108-4545: (Normally open output): Connect this line to solenoid or clutch coil.

Yellow — RPM Input To 108-4545: Connect this line to alternator 'R' terminal.

White — Overspeed Indicator Light: (Normally closed output); Connect this line to overspeed light.

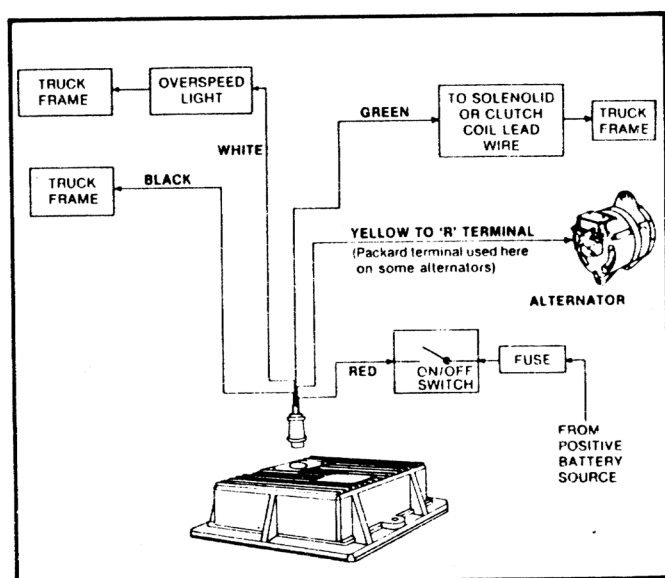


Figure 15C.

VEHICLE WIRING HARNESS TEST

1. Place positive (+) lead from voltmeter in the TACH calibration jack and the negative (-) lead to frame. Set on 0-20 vdc scale.
2. Start engine advance engine to 1200 RPM and return to idle.
3. Increase and decrease engine RPM and observe voltmeter. The voltage should increase and decrease with engine speed.
4. Place positive (+) lead from voltmeter in the engage jack. If there is no voltage then unit is not receiving current on the red wire.
5. When the engine is shut off and the PTO/clutch switch is activated the red overspeed light should be on.

Refer to trouble shooting guide if any test fails.

108-4545 SPEED ADJUSTMENT PROCEDURE USING A VOLTMETER.

1. The 108-4545 has test jacks to allow adjustment by use of a voltmeter. The test jack voltages will be in the 0-6 VDC range. Your voltmeter should be on the lowest voltage selection which covers the range. Use the positive meter probe in the test jacks with the negative probe grounded to truck frame.
2. Start the engine, engage the PTO/clutch switch, briefly advance the engine to 1200 RPM and return to idle.
3. The TACH calibration will set the 108-4545's internal tachometer circuit to match the truck's tachometer. This test jack voltage will rise and fall with the engine speed, just as the vehicle's tachometer. Use the adjustment screw to adjust the voltmeter so that the meter displays 1.0 VDC when the truck TACH shows 1000 RPM. The meter should then display 1.5 VDC at 1500 RPM, 2.0 VDC at 2000 RPM, etc.
4. Once you have the RPM set for 1.0 VDC per 1000 RPM you can turn the engine off.
5. Make sure there is power at the 108-4545 (overspeed light should be on). Place the positive lead into the disengage jack. Using the disengage

adjustment screw adjust the voltmeter so that the display shows your desired disengagement speed based on the relationship that 1.0 VDC=1000 RPM. (Example: a disengage speed of 1800 RPM will show 1.8 VDC on your voltmeter.)

6. Place the positive lead into the engage jack. Using the engage adjustment screw adjust the voltmeter so that the display shows your desired engagement speed based on the relationship that 1.0 VDC=1000 RPM.

NOTE: The DISENGAGE is to be set first, then the ENGAGE. Also, when the engine is running the ENGAGE test jack will show 6 VDC or 6000 RPM when the 108-4545 has engaged the PTO or pump.

ADJUSTMENT PROCEDURE WITHOUT VOLTMETER

CAUTION: DO NOT TAMPER WITH TACH CALIBRATION SCREW ON 108-4545.

Helpful hint: Place a 12V test light into green wire circuit to help you determine when the PTO/clutch is engaged or disengaged.

1. Start engine, engage PTO/clutch switch, briefly advance engine to 1200 RPM and return to idle.
2. With the PTO/clutch on, turn the disengage screw five turns clockwise and the engage screw five turns clockwise.
3. Advance engine to desired disengage speed and hold.
4. Slowly turn disengage screw counter clockwise until the PTO/clutch turns off. The red overspeed light should come on.
5. Reduce the engine speed to the desired engage speed and hold.
6. Slowly turn engage screw clockwise until the PTO/clutch turns back on.

USING THE ET-100 WITH THE 108-4545

If using the ET-100 Electronic Systems Performance Test Set refer to the ET-100 operating instructions.

An additional set of conversion plugs will be required (108-4545-06) to convert an existing ET-100 for use with the 108-4545

RECALIBRATION PROCEDURES

1. Turn 108-4545 TACH calibration screw 22 turns clockwise.
2. Turn disengage screw 15 turns clockwise.
3. Turn engage screw 15 turns clockwise.
4. Follow the adjustment procedures.

OVERSPEED SWITCH TROUBLE SHOOTING GUIDE

PROBLEM	TEST Voltmeter/ET-100	CAUSE	SOLUTION
Unit will not engage and overspeed light not on	No current at red wire. /No red light on ET-100.	<ul style="list-style-type: none"> • Blown fuse. • Poor ground connection. • Reverse polarity. • Connection, splice or harness connection loose. 	<ul style="list-style-type: none"> • See problem "Blown Fuse" • Check crimped and frame connections. • Interchange red and black leads. • Check crimped connections. Make sure pin connector is in proper alignment and ring tight.
Unit will not engage and overspeed light always on	Voltage at TACH jack does not increase with engine speed. / No yellow light.	<ul style="list-style-type: none"> • Alternator not engaged. • Incorrect alternator terminal. • Poor or loose connection. 	<ul style="list-style-type: none"> • Briefly run engine between 1200-1500 RPM. • Contact dealer. • Check crimp and connection of brown wire.
	Voltage at TACH jack does increase and decrease with engine speed. / Yellow light on.	<ul style="list-style-type: none"> • Poor or loose connection. • Unit out of adjustment. 	<ul style="list-style-type: none"> • Check crimp and connection of green wire. • See adjustment procedure.
Unit will not disengage	Voltage at green wire. / Green light always on.	<ul style="list-style-type: none"> • Unit out of adjustment. • Faulty 108-4545 	<ul style="list-style-type: none"> • See adjustment procedure. • Return for inspection.
Intermittent operation	Changes in voltage. / Any flashing light.	<ul style="list-style-type: none"> • Poor connection. 	<ul style="list-style-type: none"> • Check crimped and ground connections.
Blown fuse		<ul style="list-style-type: none"> • Failed solenoid or clutch coil, shorted output lead, faulty 108-4545 	<ul style="list-style-type: none"> • Examine wiring harness and connections for possible short circuits. Check out and replace faulty components.

ALTERNATOR "R" STATOR TERMINAL CORROSION PROTECTION

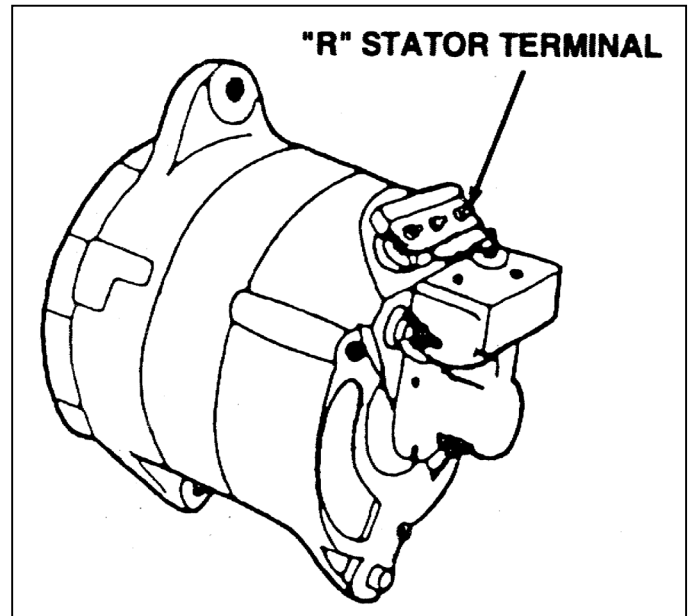
The "R" stator terminal on alternators may become corroded due to oxygen in the atmosphere combining with the impurities on the surface of the exposed conductor. This corrosion may interfere with the alternator's RPM signal, in turn adversely affecting the performance of the EOS (electronic overspeed switch).

To prevent the corrosion from occurring, a sealant must be applied to the terminal to prevent oxygen in the atmosphere from coming in contact with the conductor.

There are two (2) main types of connections on the "R" stator terminal:

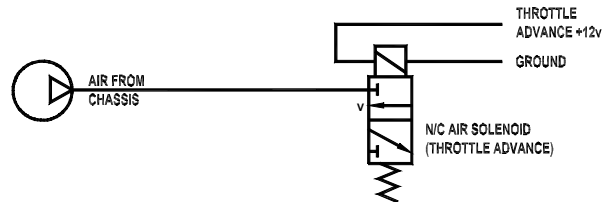
1. A 3/8" female stud type connector and
2. A molded pin plug.

Dipit is recommended for use on the stud type and an antioxidant grease is recommended for the plug type connection.



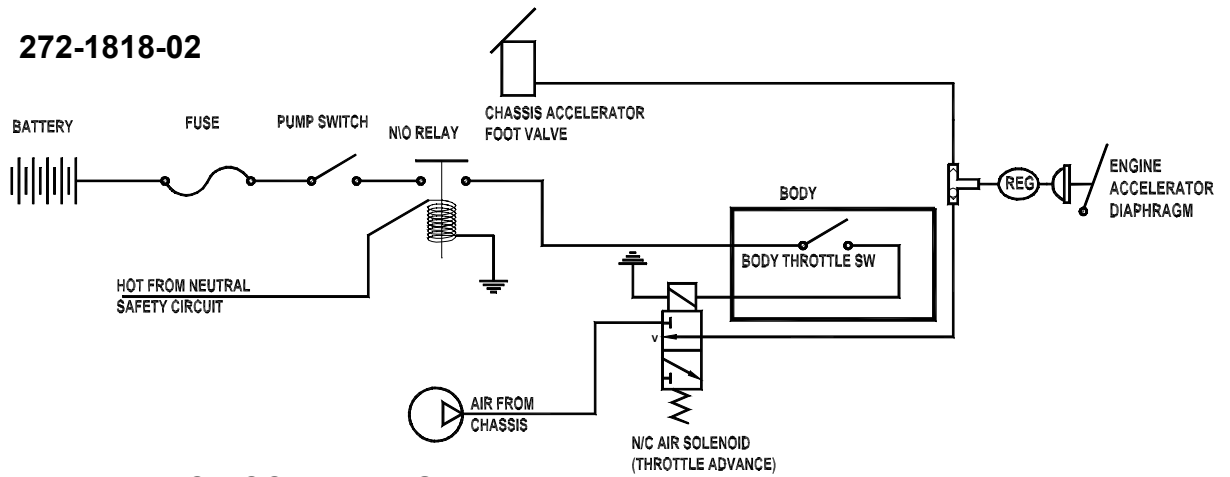
PNEUMATIC and MECHANICAL THROTTLE ADVANCE

272-1818-01



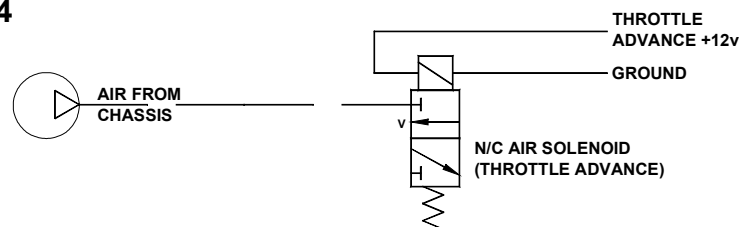
MECHANICAL LINKAGE ACCELERATOR

272-1818-02



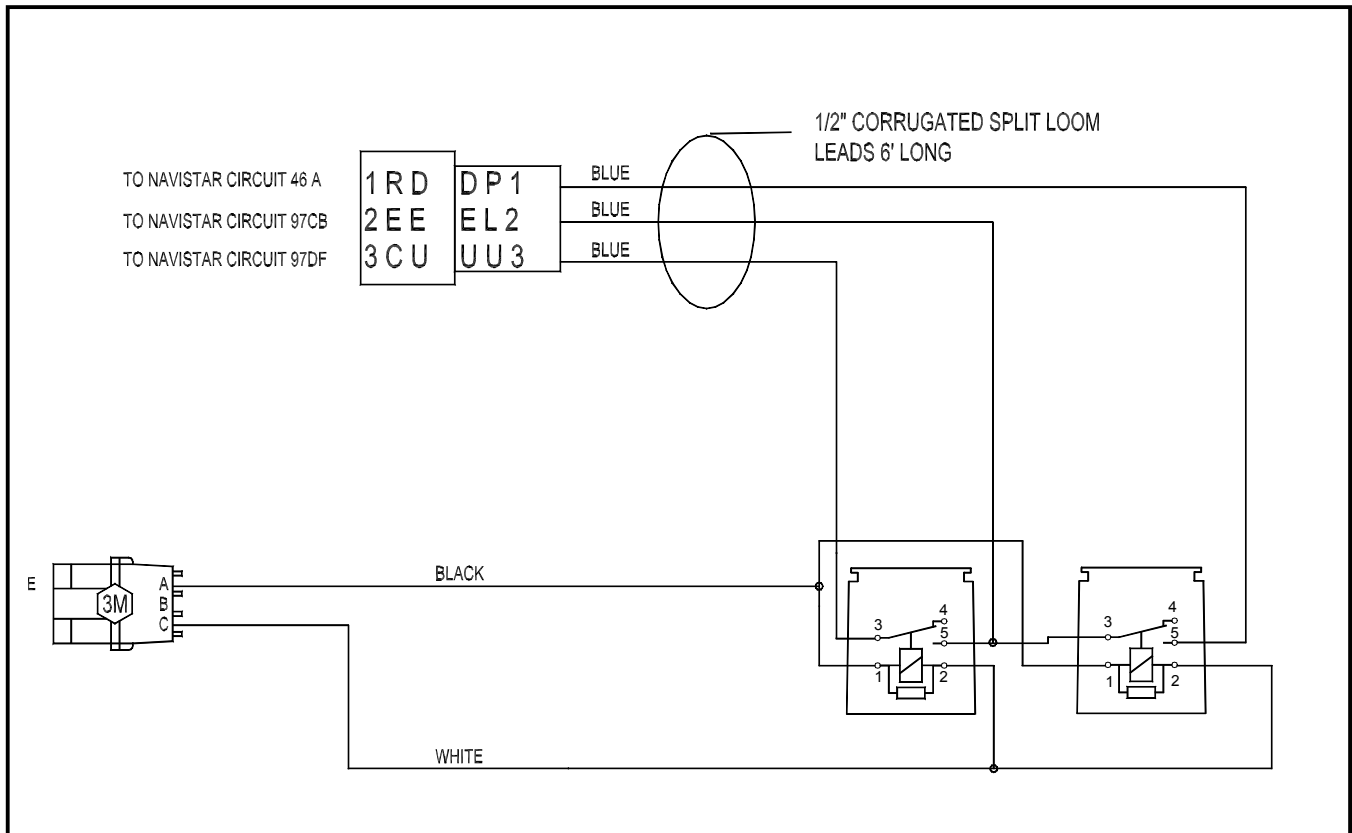
PNEUMATIC ACCELERATOR

272-1818-24

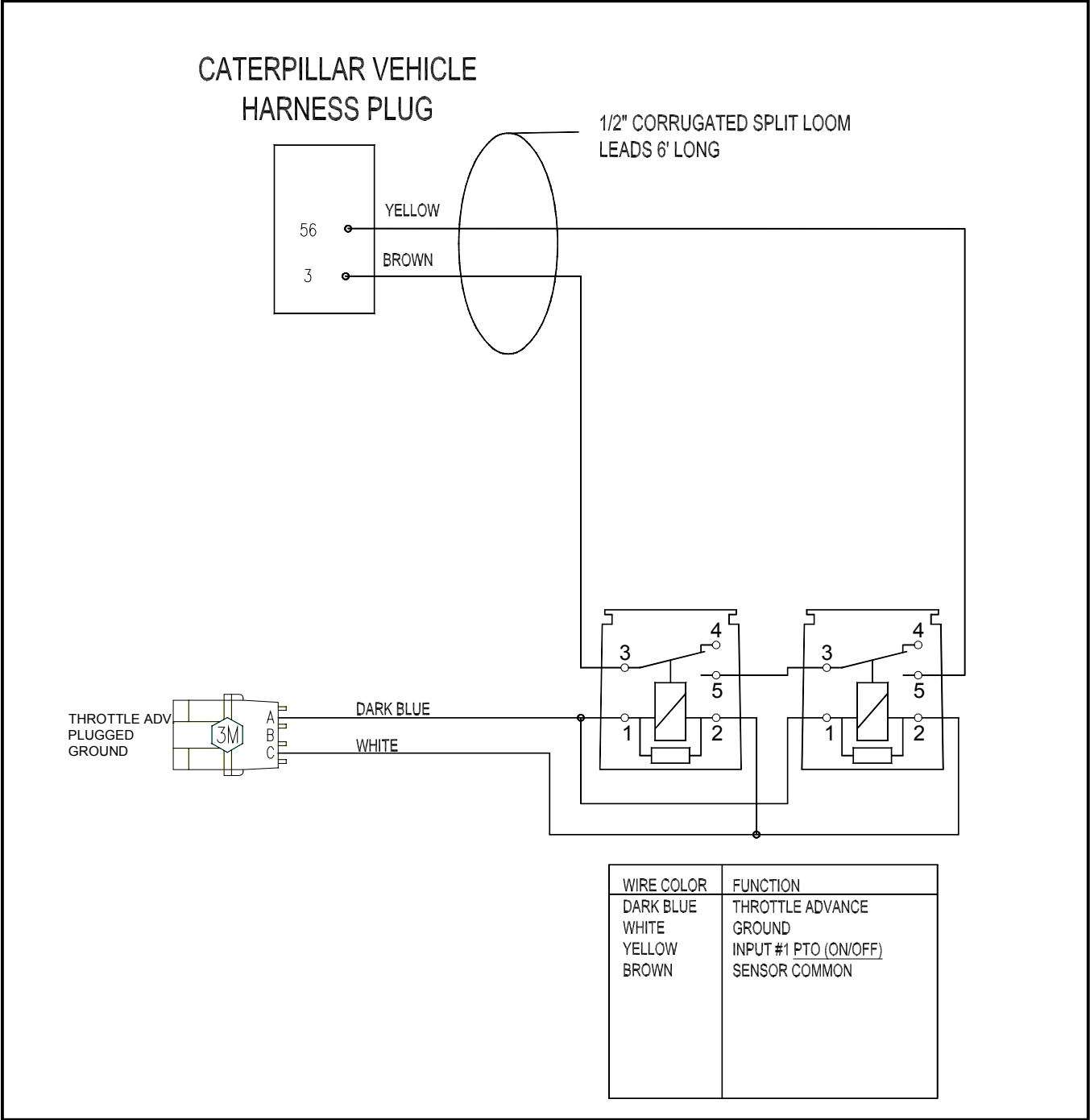


MECHANICAL LINKAGE ACCELERATOR – 24v DC CHASSIS

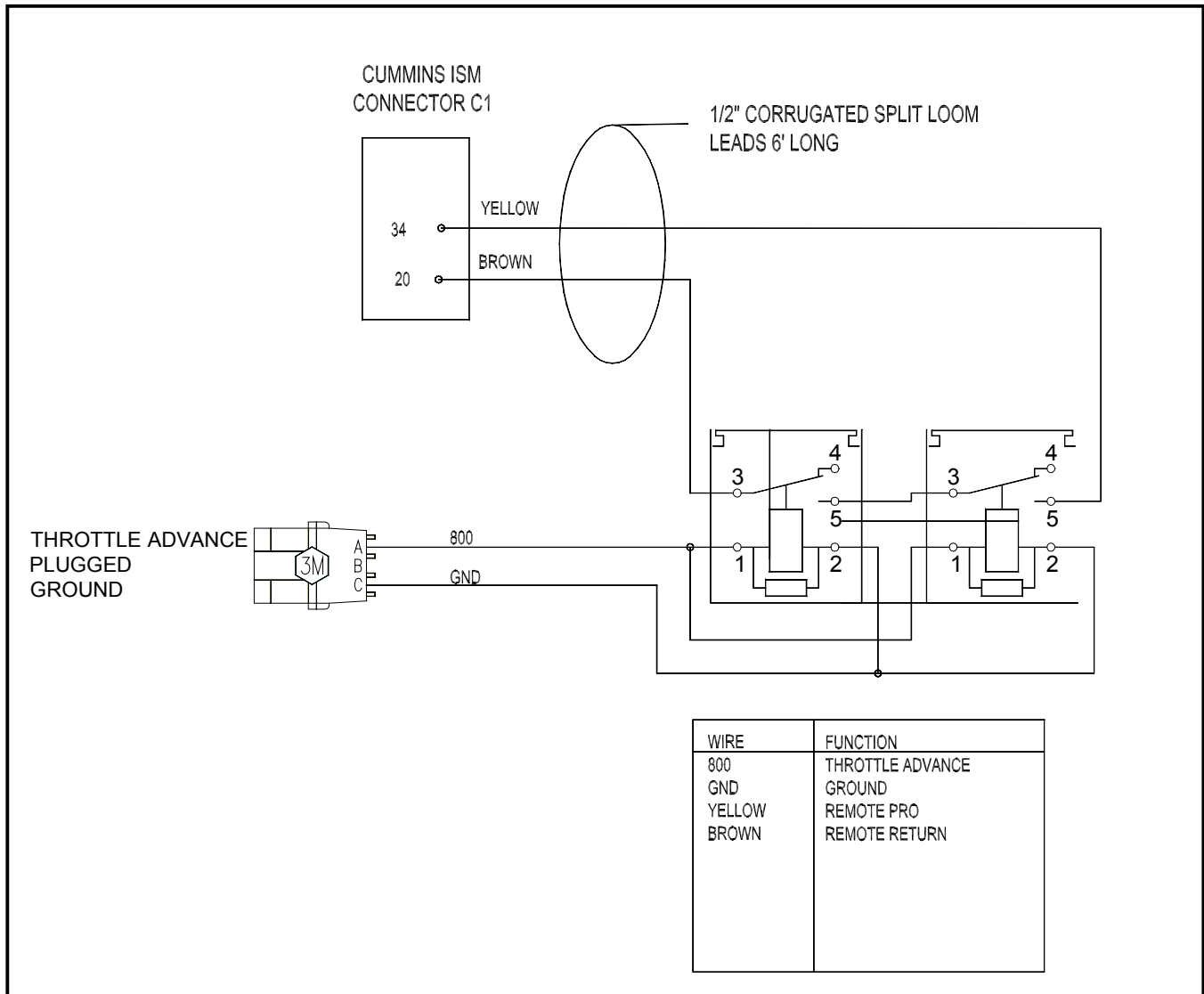
**THROTTLE ADVANCE for ELECTRONIC CONTROLLED
NAVISTAR ENGINE
272-1818-120**



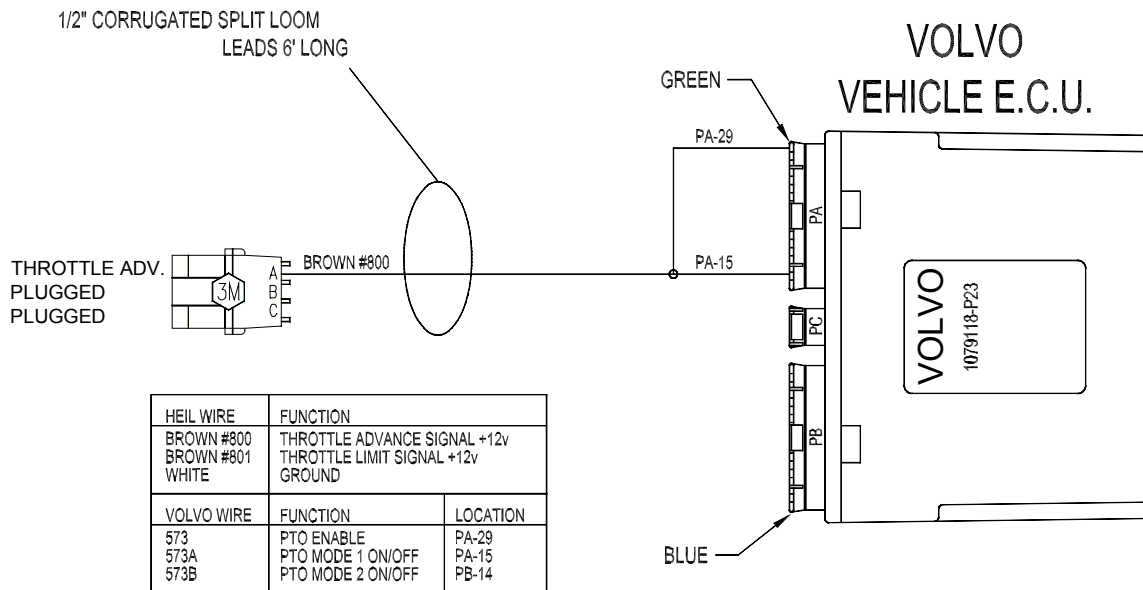
THROTTLE ADVANCE for ELECTRONIC CONTROLLED
CAT ENGINE
272-1818-121



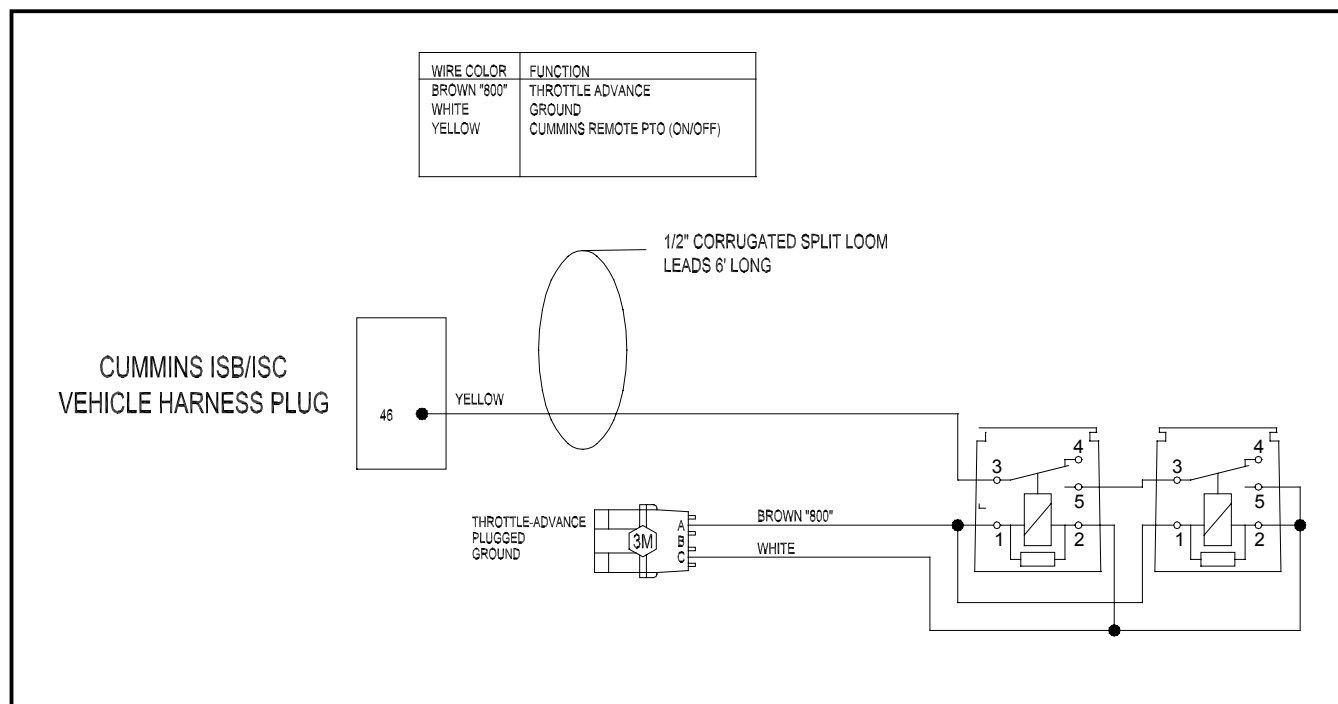
©COPYRIGHT 2004, HEIL



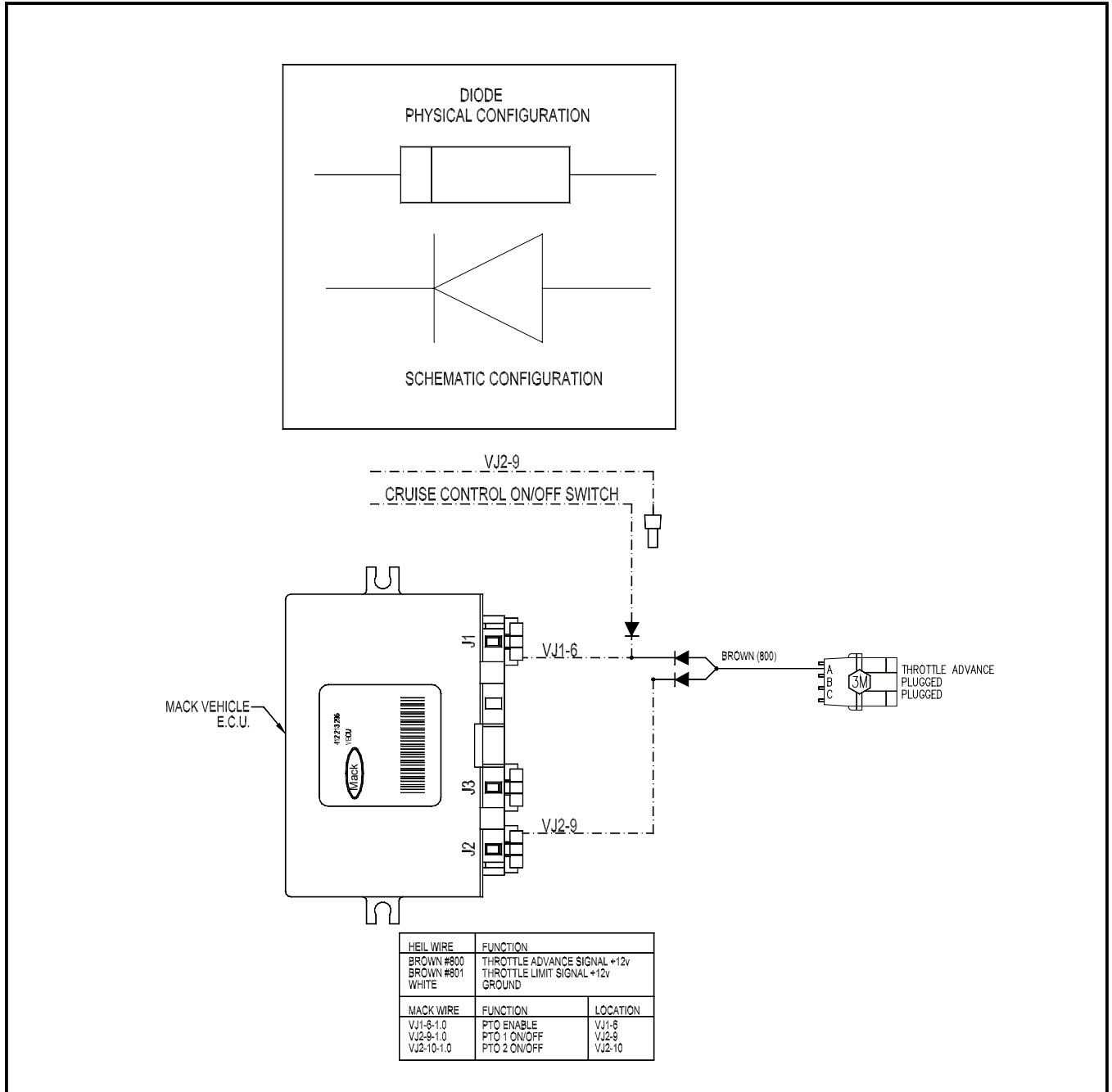
**THROTTLE ADVANCE for ELECTRONIC CONTROLLED
VOLVO ENGINE
272-1818-127**



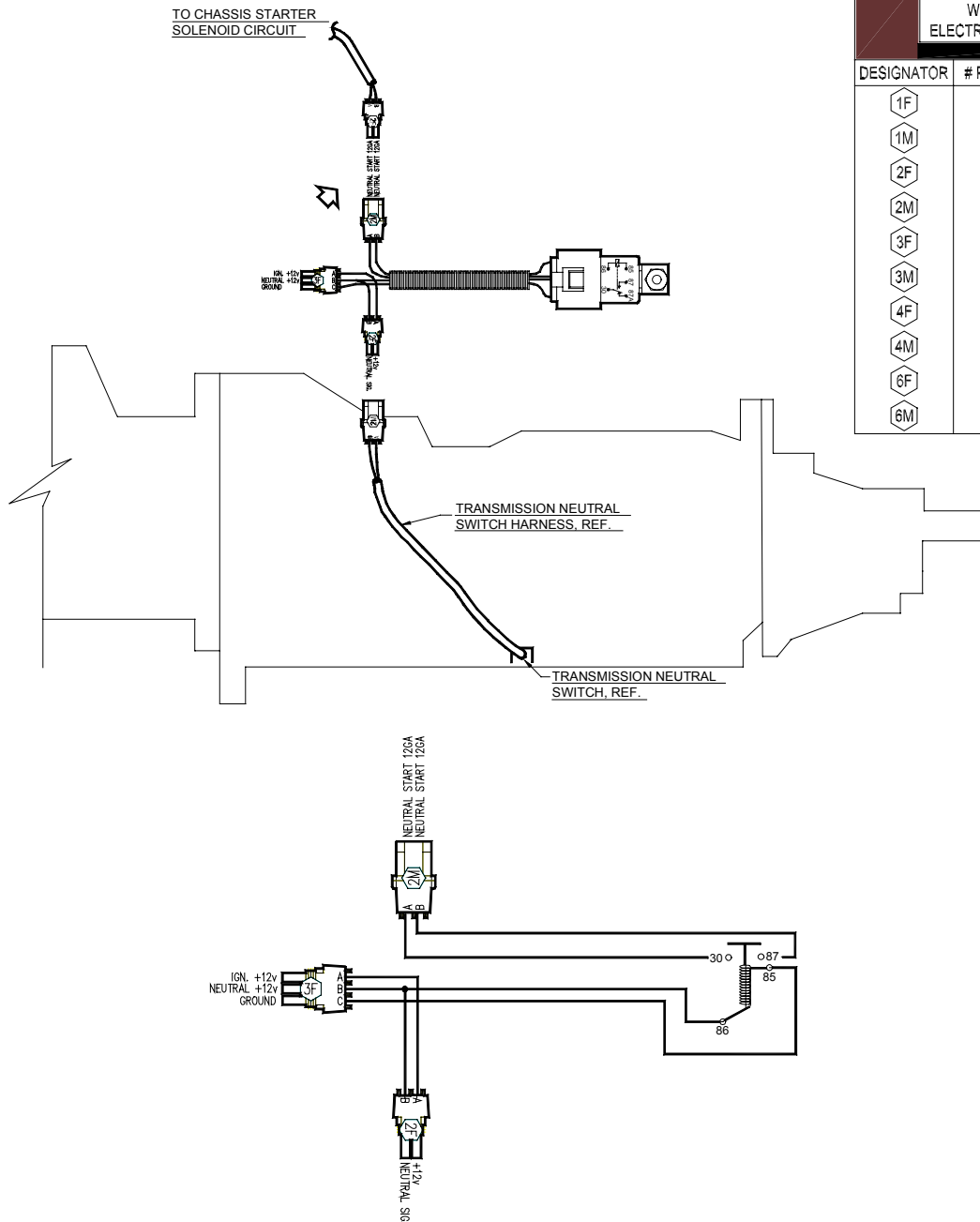
**THROTTLE ADVANCE for ELECTRONIC CONTROLLED
CUMMINS ISB/ISC ENGINE
272-1818-128**



THROTTLE ADVANCE for ELECTRONIC CONTROLLED Vmack ENGINES 272-1818-129

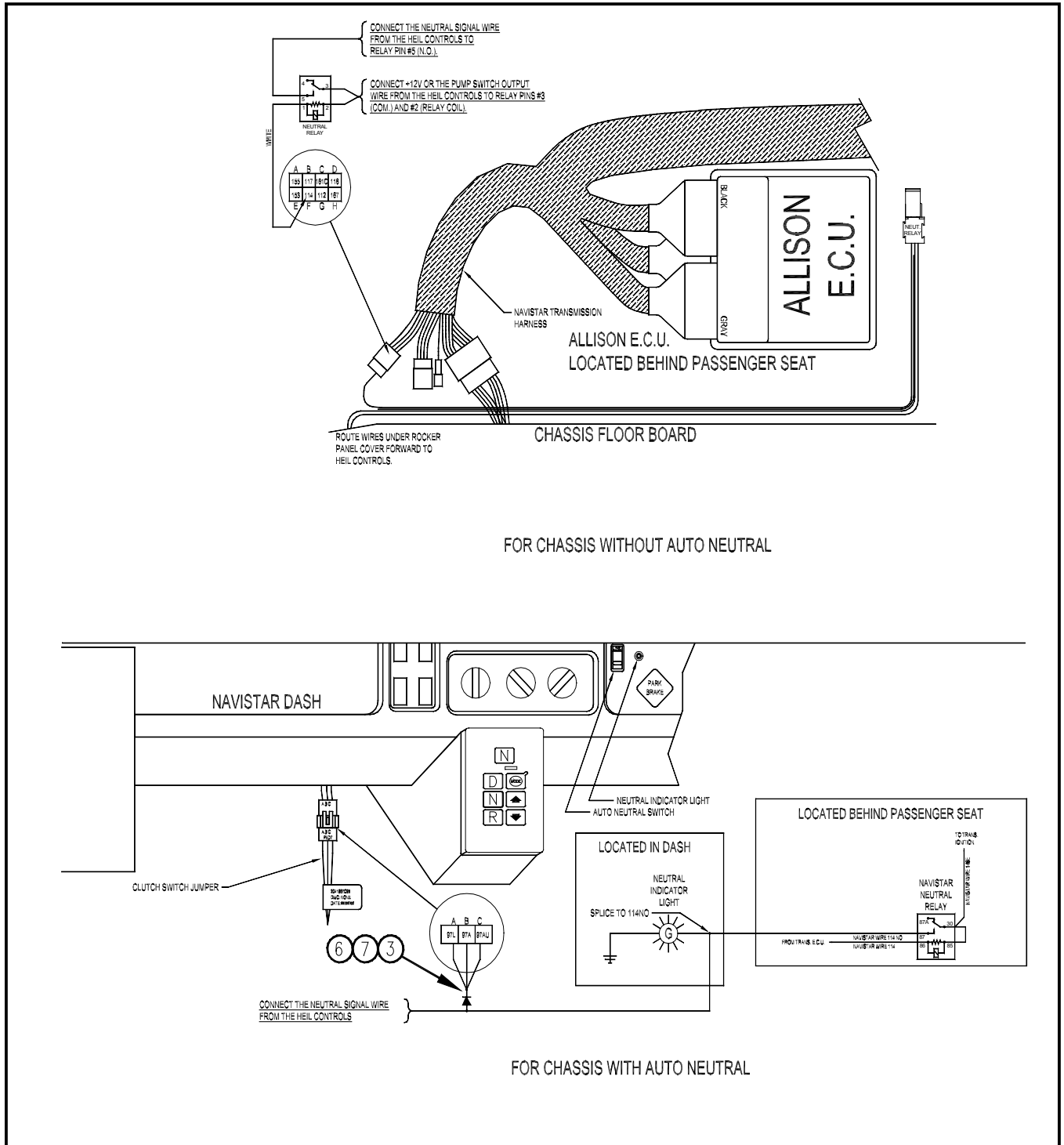


NEUTRAL SWITCH KIT for AUTOMATIC TRANSMISSION (NON-ELECTRONIC) 272-3183-01

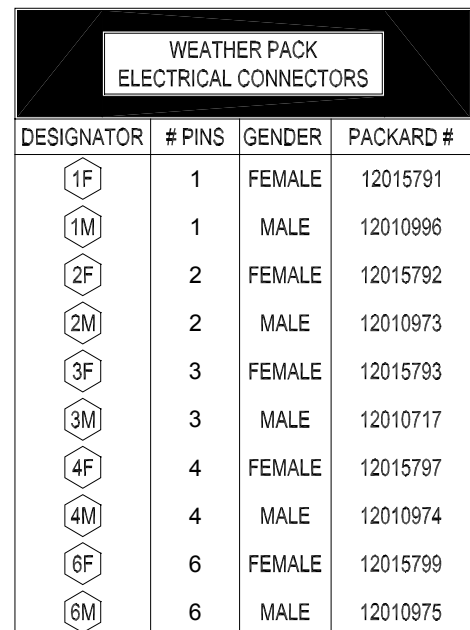


WEATHER PACK ELECTRICAL CONNECTORS			
DESIGNATOR	# PINS	GENDER	PACKARD #
1F	1	FEMALE	12015791
1M	1	MALE	12010996
2F	2	FEMALE	12015792
2M	2	MALE	12010973
3F	3	FEMALE	12015793
3M	3	MALE	12010717
4F	4	FEMALE	12015797
4M	4	MALE	12010974
6F	6	FEMALE	12015799
6M	6	MALE	12010975

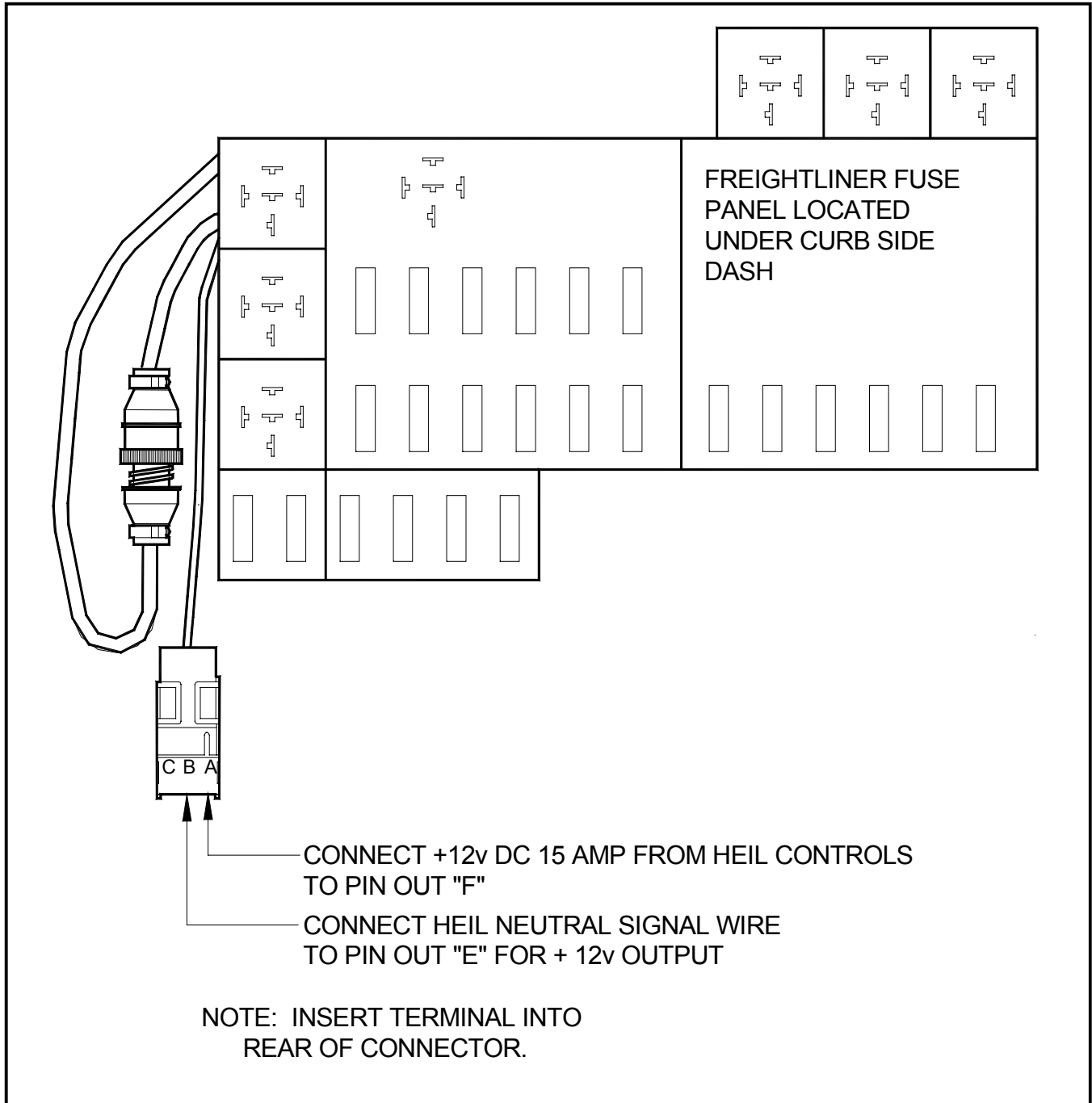
NEUTRAL SWITCH KIT for NAVISTAR CHASSIS with ALLISON WORLD TRANSMISSION 272-3183-08



©COPYRIGHT 2004, HEIL

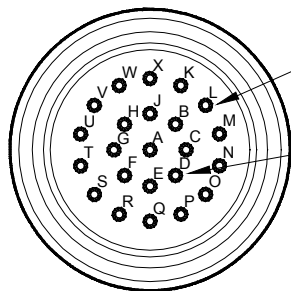
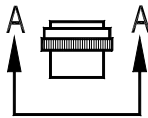
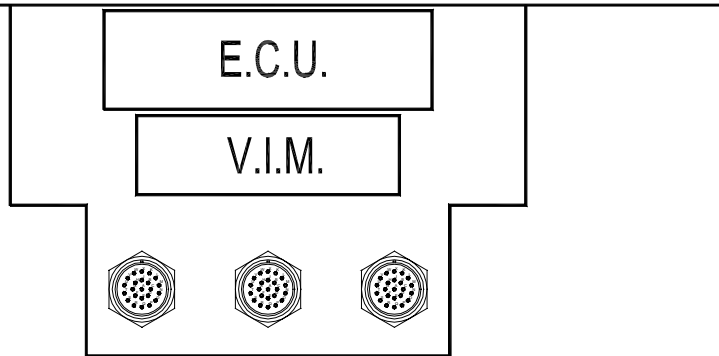


**NEUTRAL SWITCH KIT for FREIGHTLINER CHASSIS
and ALLISON WORLD TRANSMISSION
272-3183-05**



NEUTRAL SWITCH KIT for FORD LOUISVILLE
with ALLISON WORLD TRANSMISSION
272-3183-06

TRANSMISSION E.C.U. & V.I.M ARE LOCATED
 BENEATH FLOOR ATTACHED TO UNDER SIDE
 OF ACCESS PANEL OVER TRANSMISSION

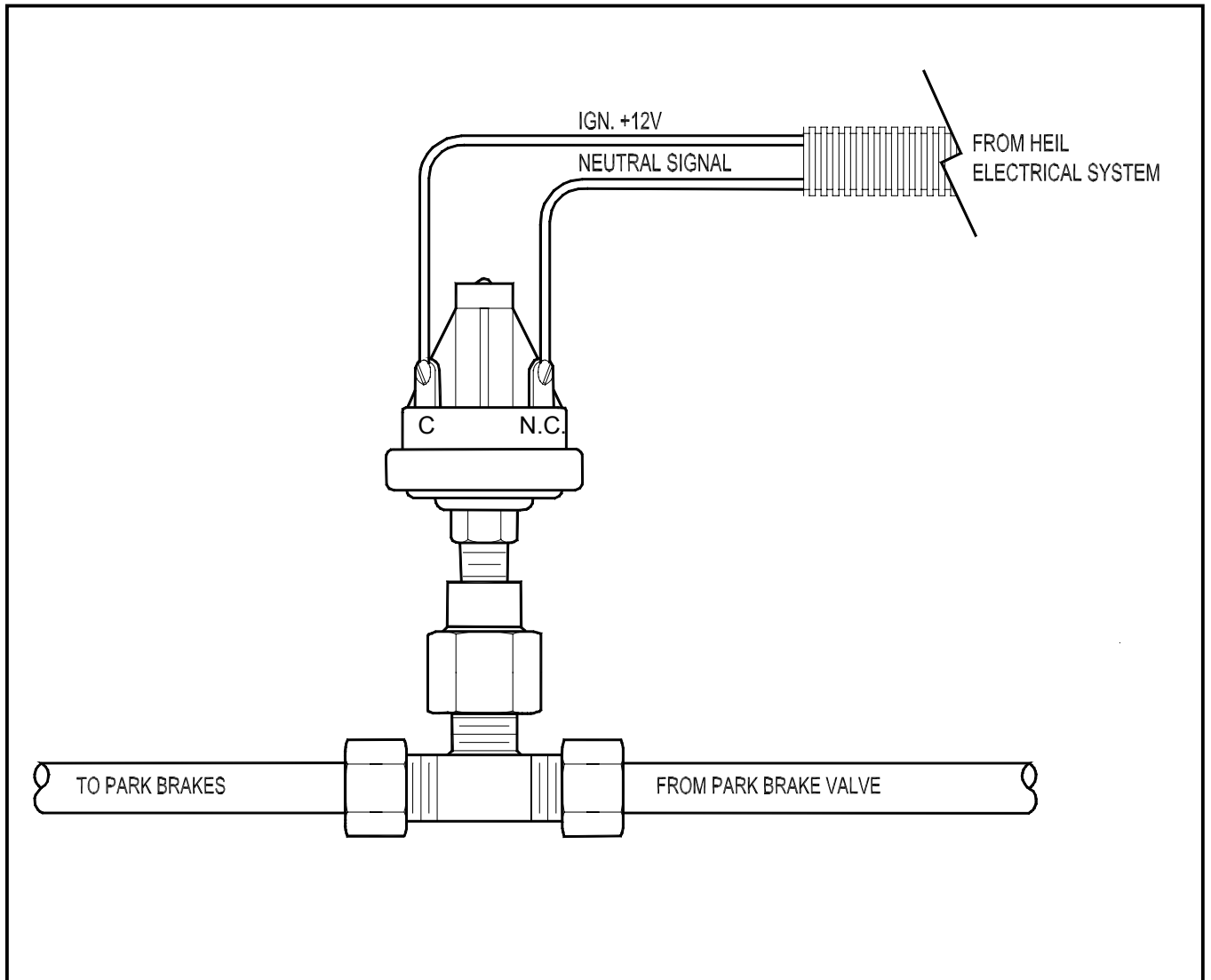


VIEW "A"

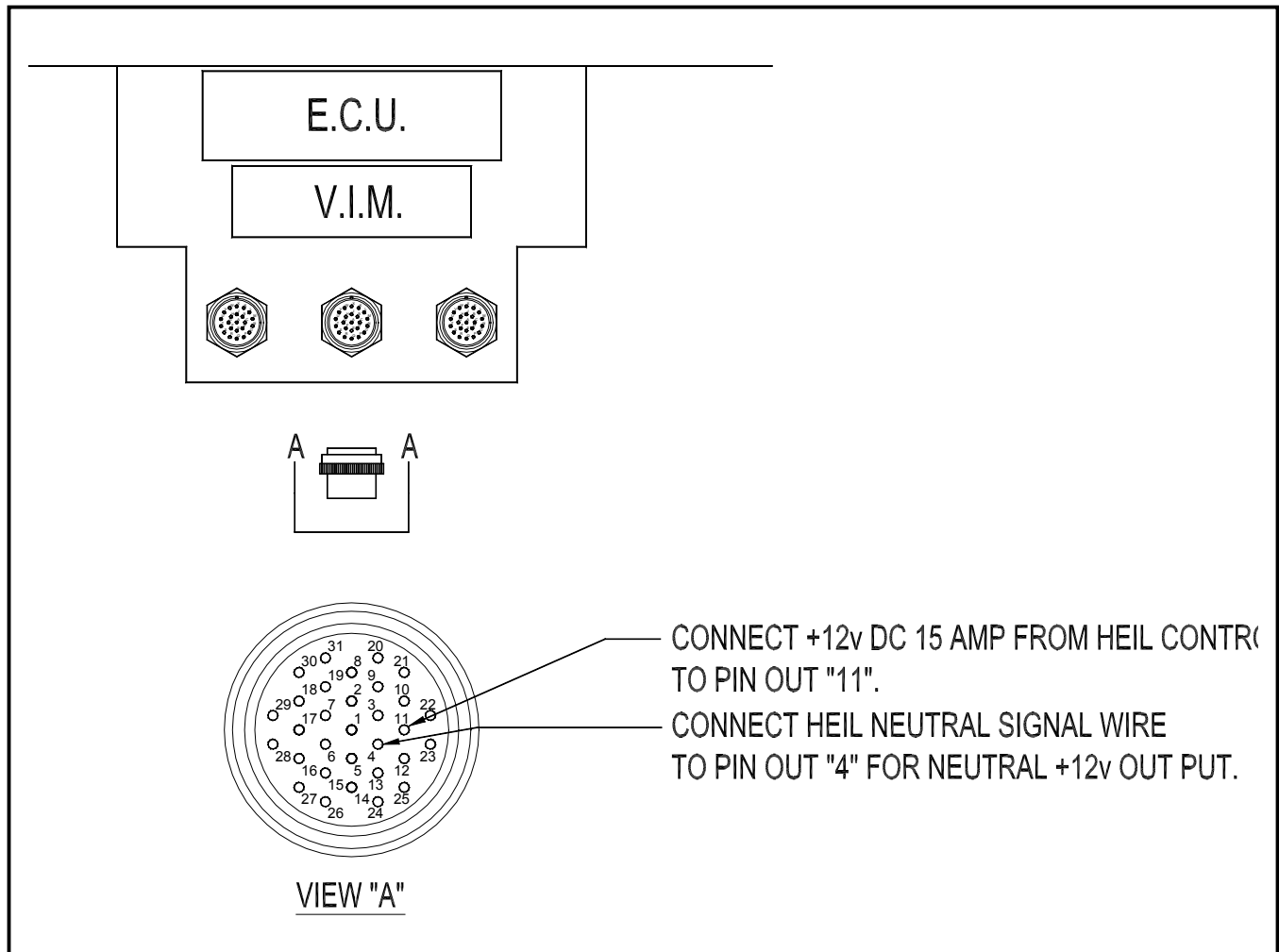
CONNECT +12v DC 15 AMP FROM HEIL CONTROLS
 TO PIN OUT "L".

CONNECT HEIL NEUTRAL SIGNAL WIRE
 TO PIN OUT "D" FOR NEUTRAL +12v OUT PUT.

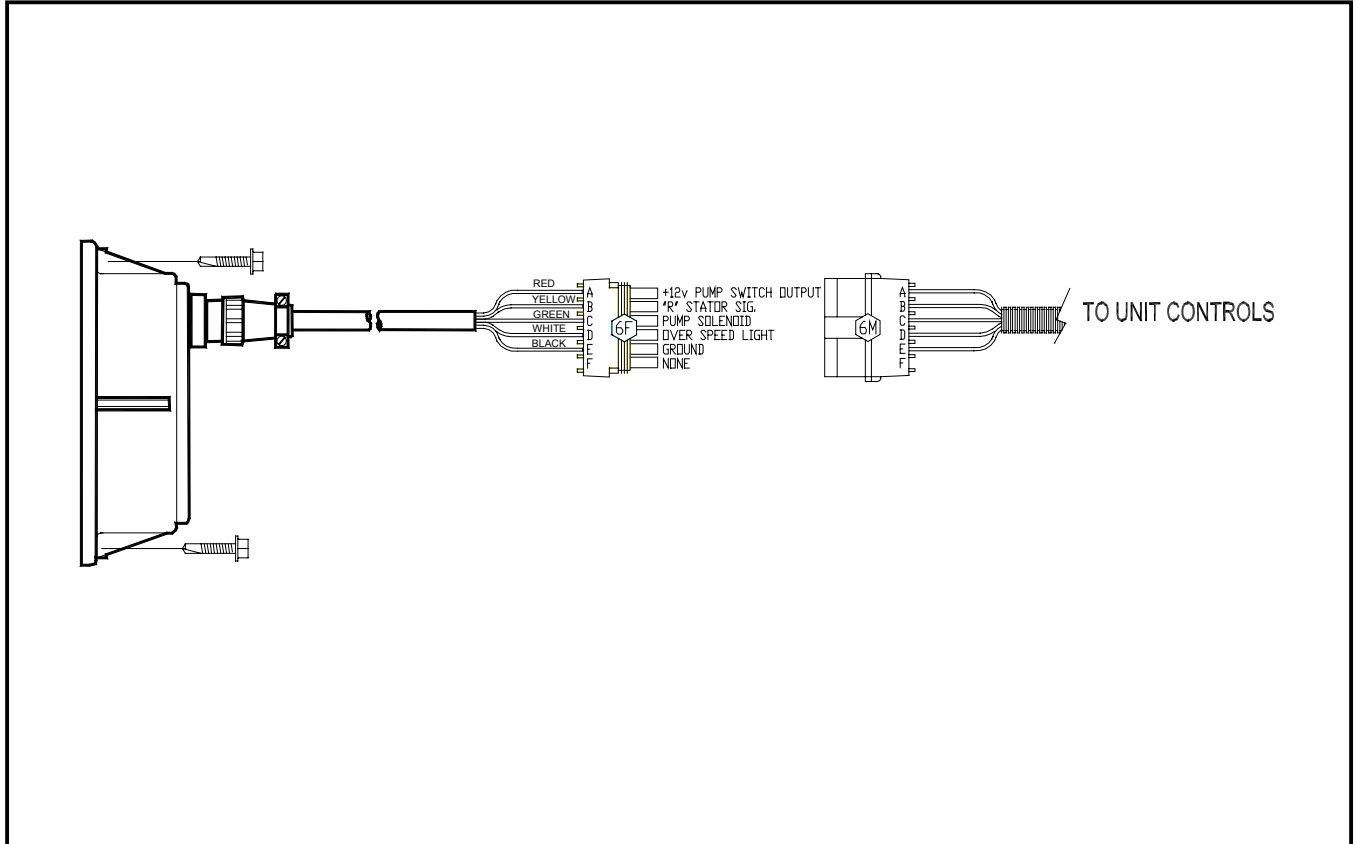
NEUTRAL SWITCH KIT for MANUAL TRANSMISSION
272-3183-07



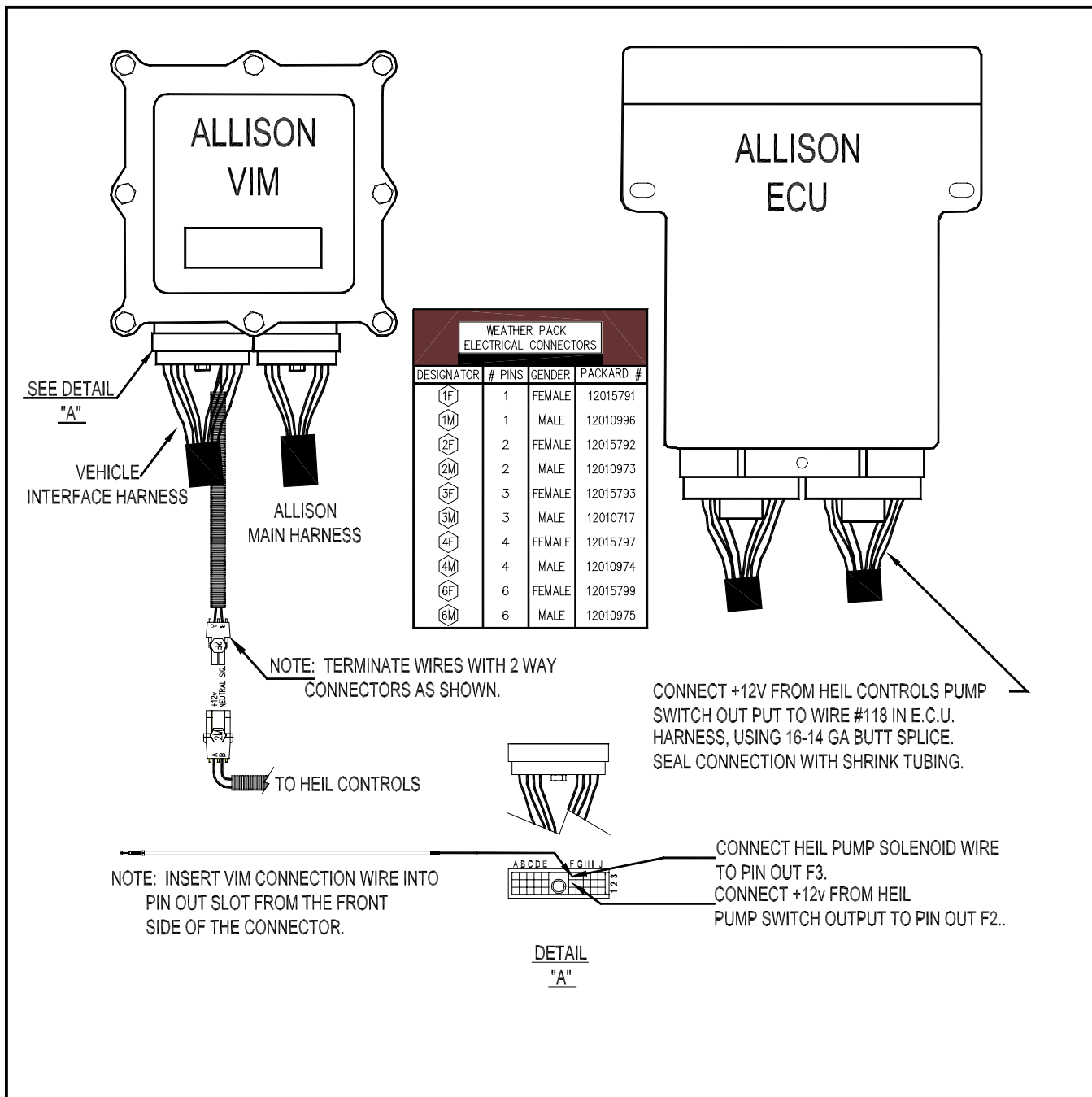
**NEUTRAL SWITCH KIT for
STERLING 1999 CHASSIS with ALLISON WORLD TRANSMISSION
272-3183-09**



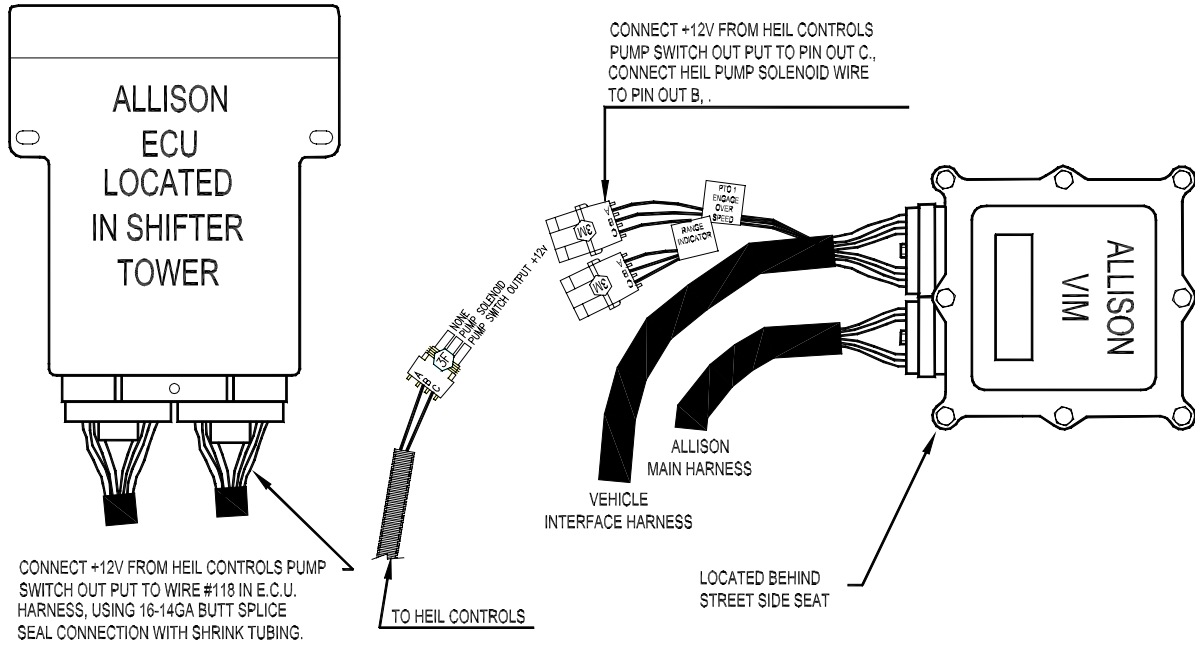
**(EOS) ELECTRONIC OVERSPEED SWITCH KIT for
UNITS WITHOUT ALLISON TRANSMISSION
272-7738-01**



**(EOS) ELECTRONIC OVERSPEED SWITCH KIT for
UNITS with ALLISON TRANSMISSION
272-7738-02**

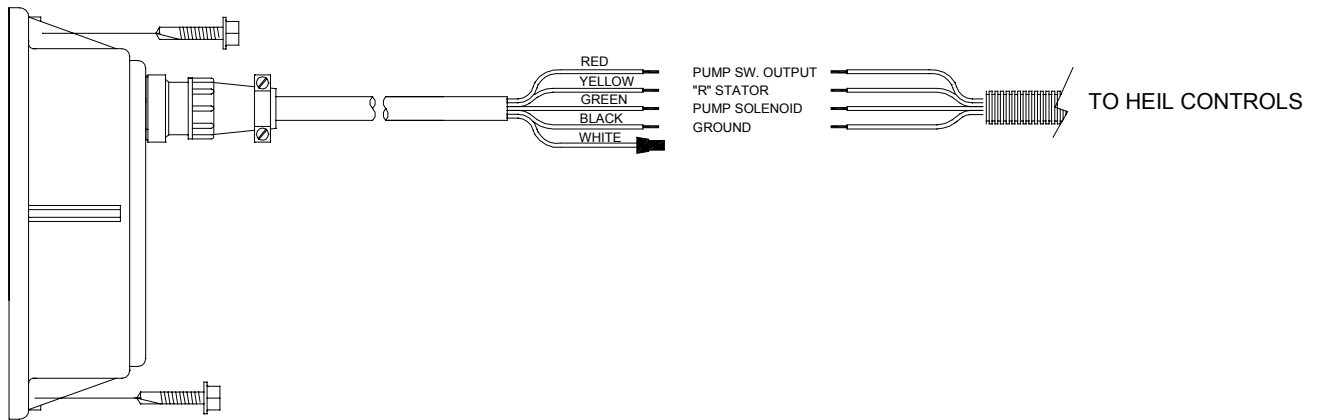


**(EOS) ELECTRONIC OVERPEED SWITCH KIT for
ALLISON WORLD TRANSMISSION/ PETERBILT 320
272-7738-03**

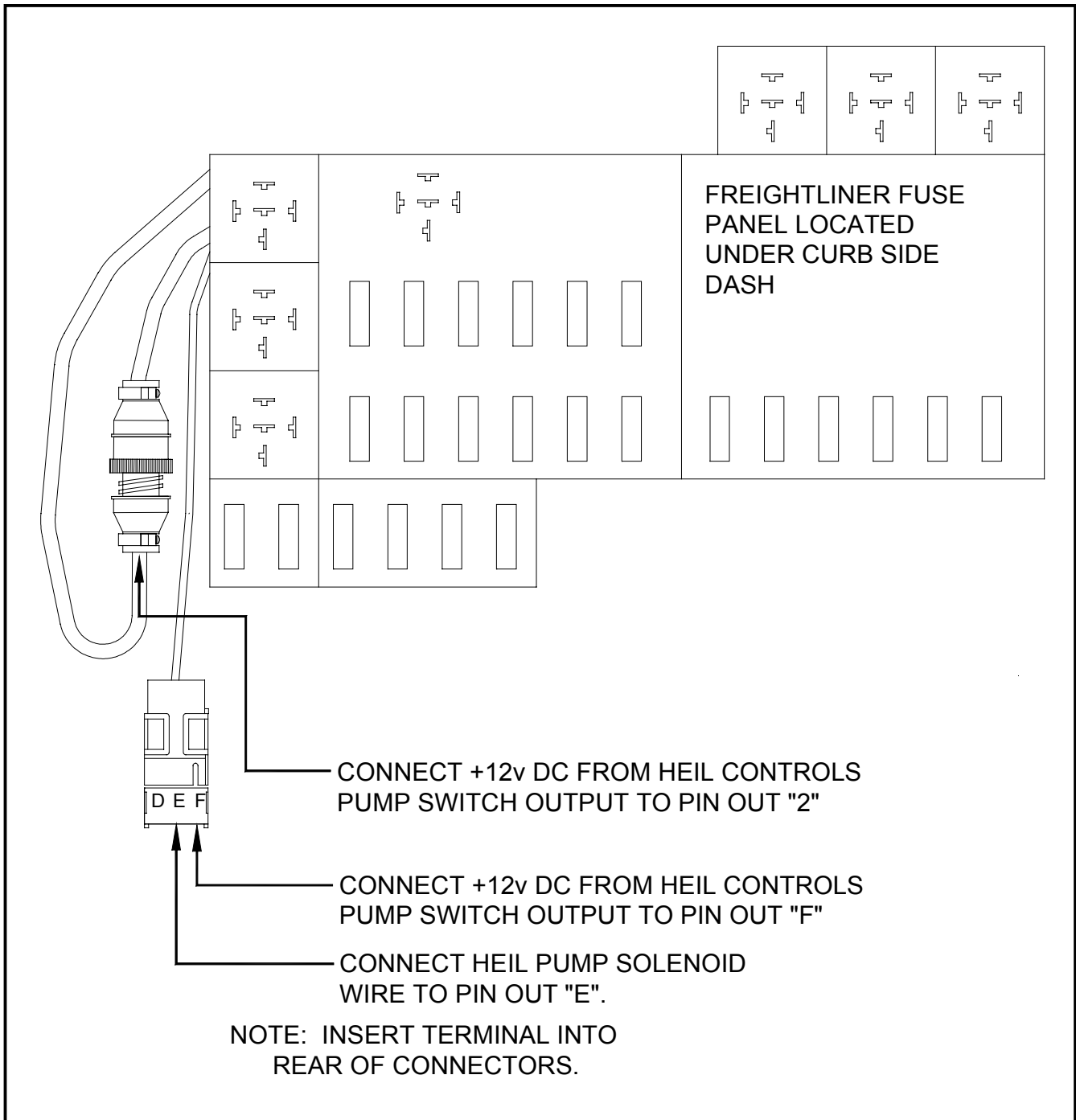


WEATHER PACK ELECTRICAL CONNECTORS			
DESIGNATOR	# PINS	GENDER	PACKARD #
1F	1	FEMALE	12015791
1M	1	MALE	12010996
2F	2	FEMALE	12015792
2M	2	MALE	12010973
3F	3	FEMALE	12015793
3M	3	MALE	12010717
4F	4	FEMALE	12015797
4M	4	MALE	12010974
6F	6	FEMALE	12015799
6M	6	MALE	12010975

**(EOS) ELECTRONIC OVERSPEED SWITCH KIT for
ALLISON WORLD TRANSMISSION and 24v DC
272-7738-124**

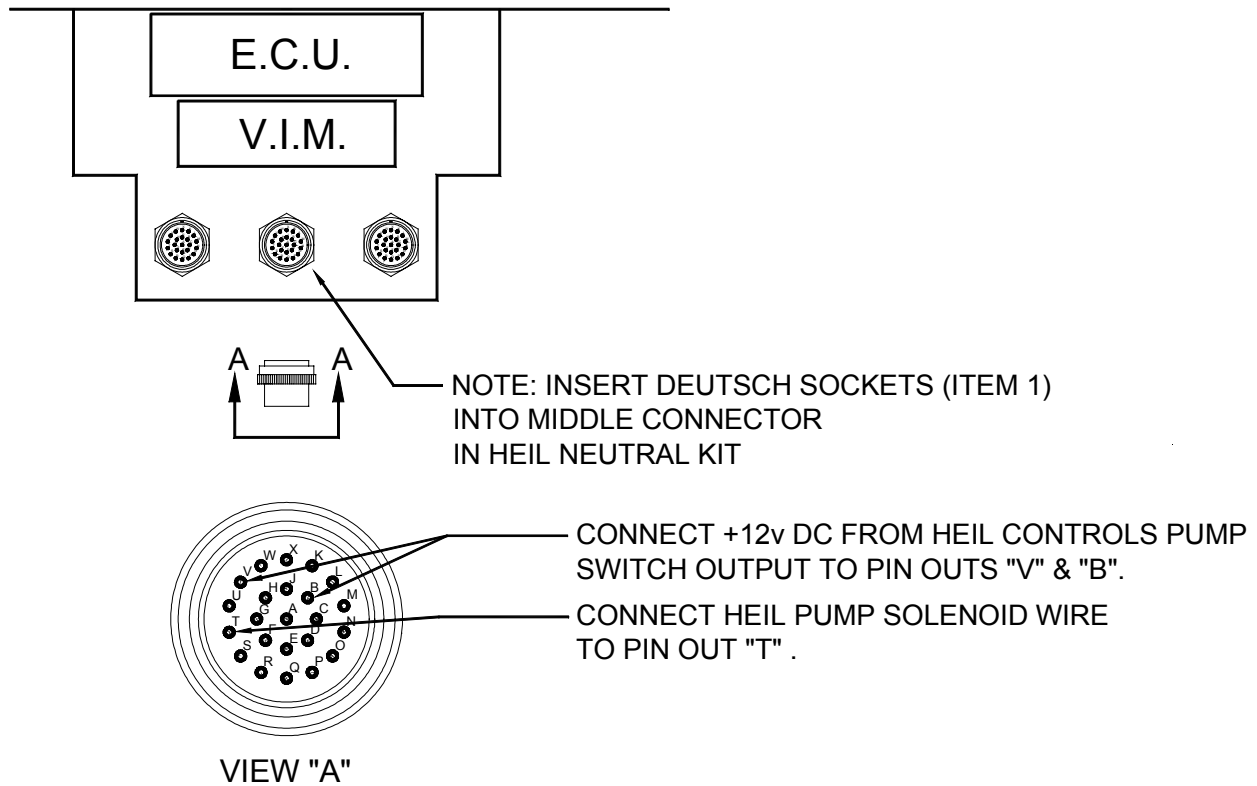


**(EOS) ELECTRONIC OVERSPEED SWITCH KIT for
ALLISON WORLD TRANSMISSION AND FREIGHTLINER CHASSIS
272-7738-05**

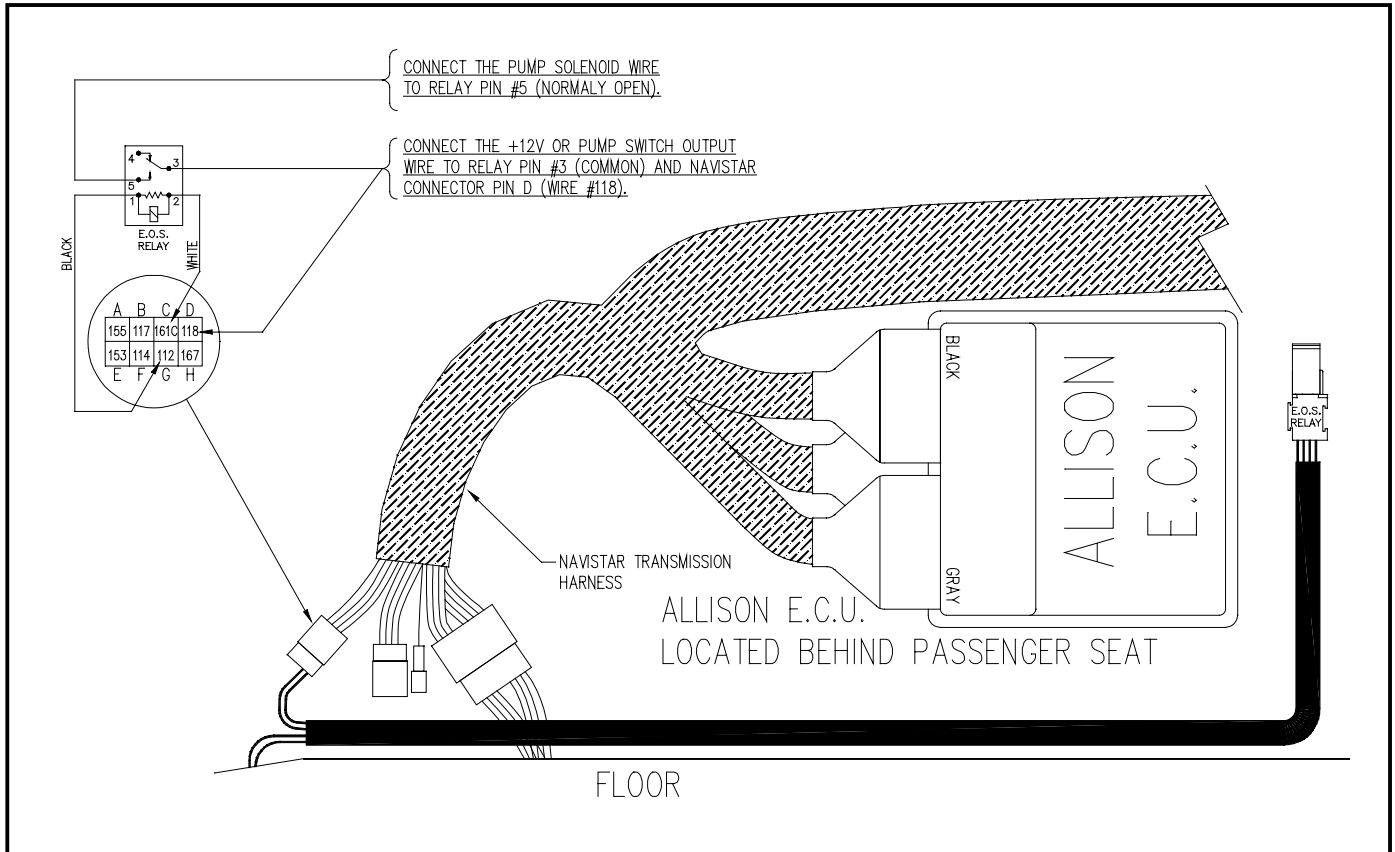


**(EOS) ELECTRONIC OVERSPEED SWITCH KIT for
ALLISON WORLD TRANSMISSION and FORD LOUISVILLE CHASSIS
272-7738-06**

TRANSMISSION E.C.U. & V.I.M ARE LOCATED
BENEATH FLOOR ATTACHED TO UNDER SIDE
OF ACCESS PANEL OVER TRANSMISSION

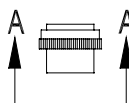
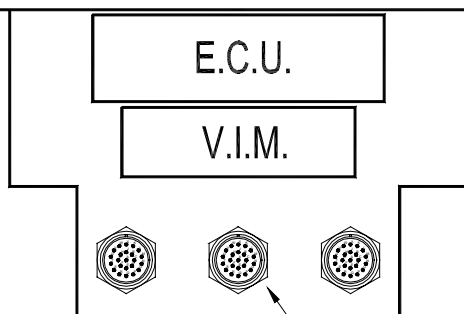


**(EOS) ELECTRONIC OVERSPEED SWITCH KIT for
ALLISON WORLD TRANSMISSION and NAVISTAR 1998 MODEL and AFTER
272-7738-08**

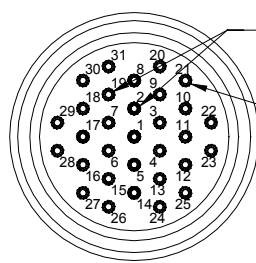


**(EOS) ELECTRONIC OVERSPEED SWITCH KIT for
ALLISON WORLD TRANSMISSION and STERLING CHASSIS
272-7738-09**

TRANSMISSION E.C.U. & V.I.M ARE LOCATED
BENEATH FLOOR ATTACHED TO UNDER SIDE
OF ACCESS PANEL OVER TRANSMISSION



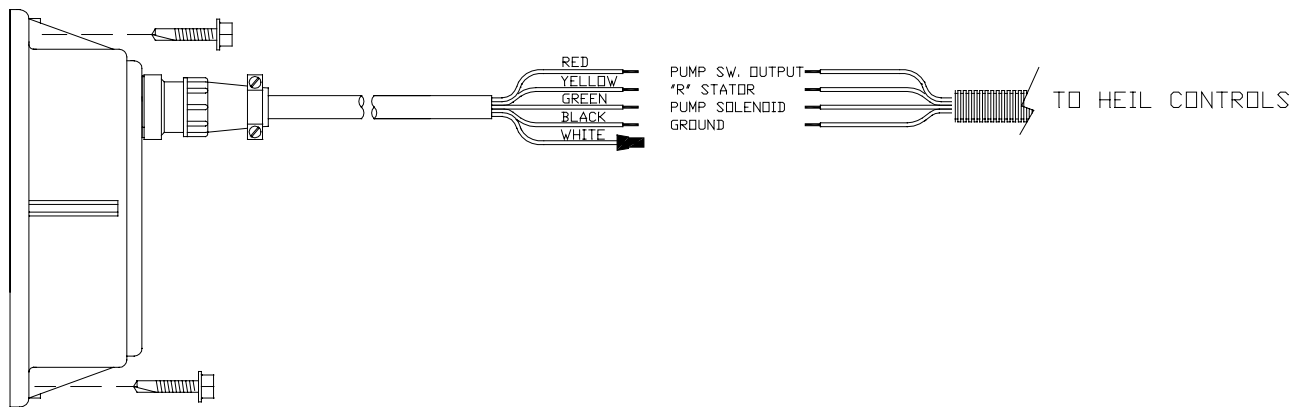
NOTE: INSERT DEUTSCH SOCKETS (ITEM 1)
INTO MIDDLE CONNECTOR



VIEW "A"

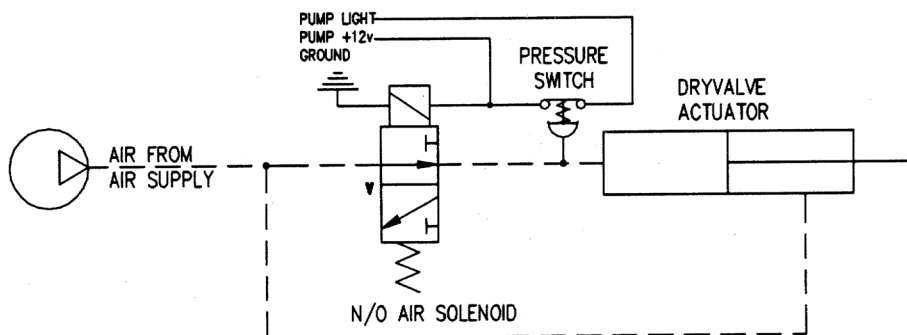
CONNECT +12v DC FROM HEIL CONTROLS PUMP
SWITCH OUTPUT TO PIN OUTS "2" & "19".
CONNECT HEIL PUMP SOLENOID WIRE
TO PIN OUT "21".

**(EOS) ELECTRONIC OVERSPEED SWITCH KIT for
ALLISON WORLD TRANSMISSION and 24v DC
272-7738-124**

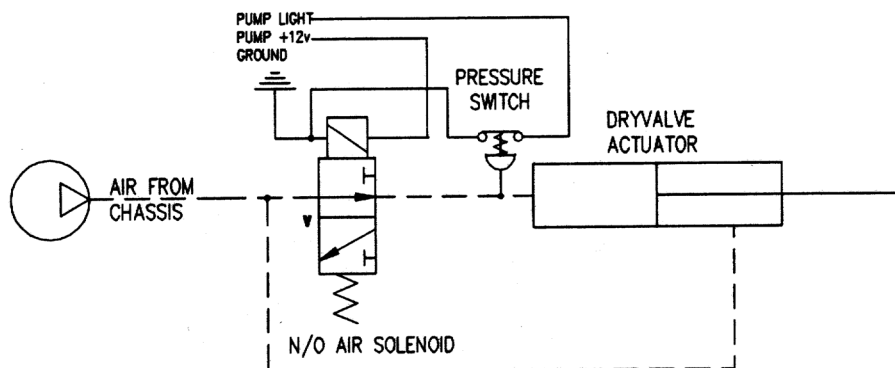


**PUMP AIR SHIFT KITS
PNEUMATIC/ELECTRICAL DIAGRAMS
272-7973**

**FOR USE WHEN PUMP INDICATOR LIGHT
REQUIRES A +12V SIGNAL FROM PRESSURE SWITCH**



**FOR USE WHEN PUMP INDICATOR LIGHT
REQUIRES A GROUND SIGNAL FROM PRESSURE SWITCH**



HEIL PLC INFORMATION

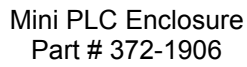
Program No. 109-0205

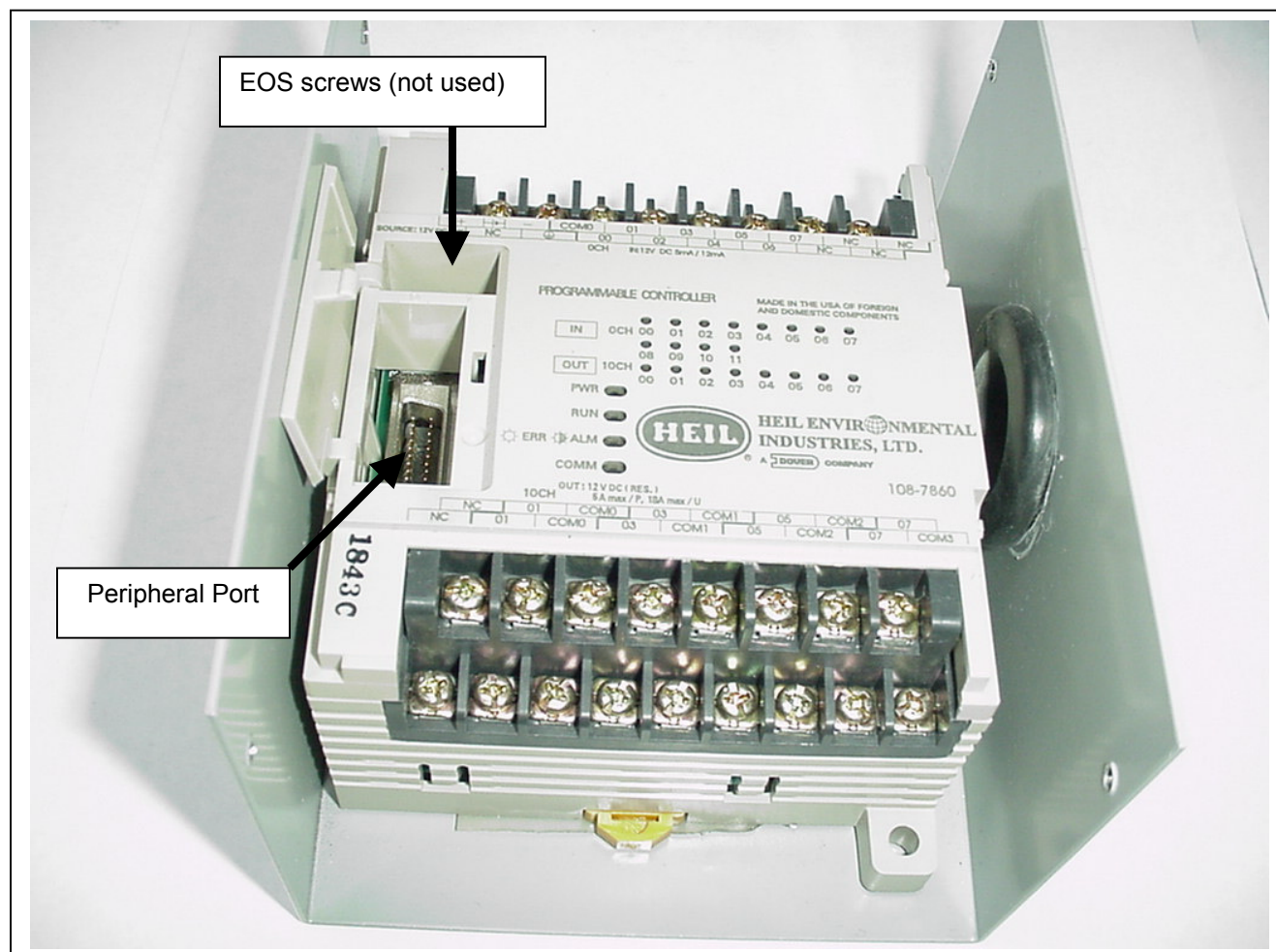
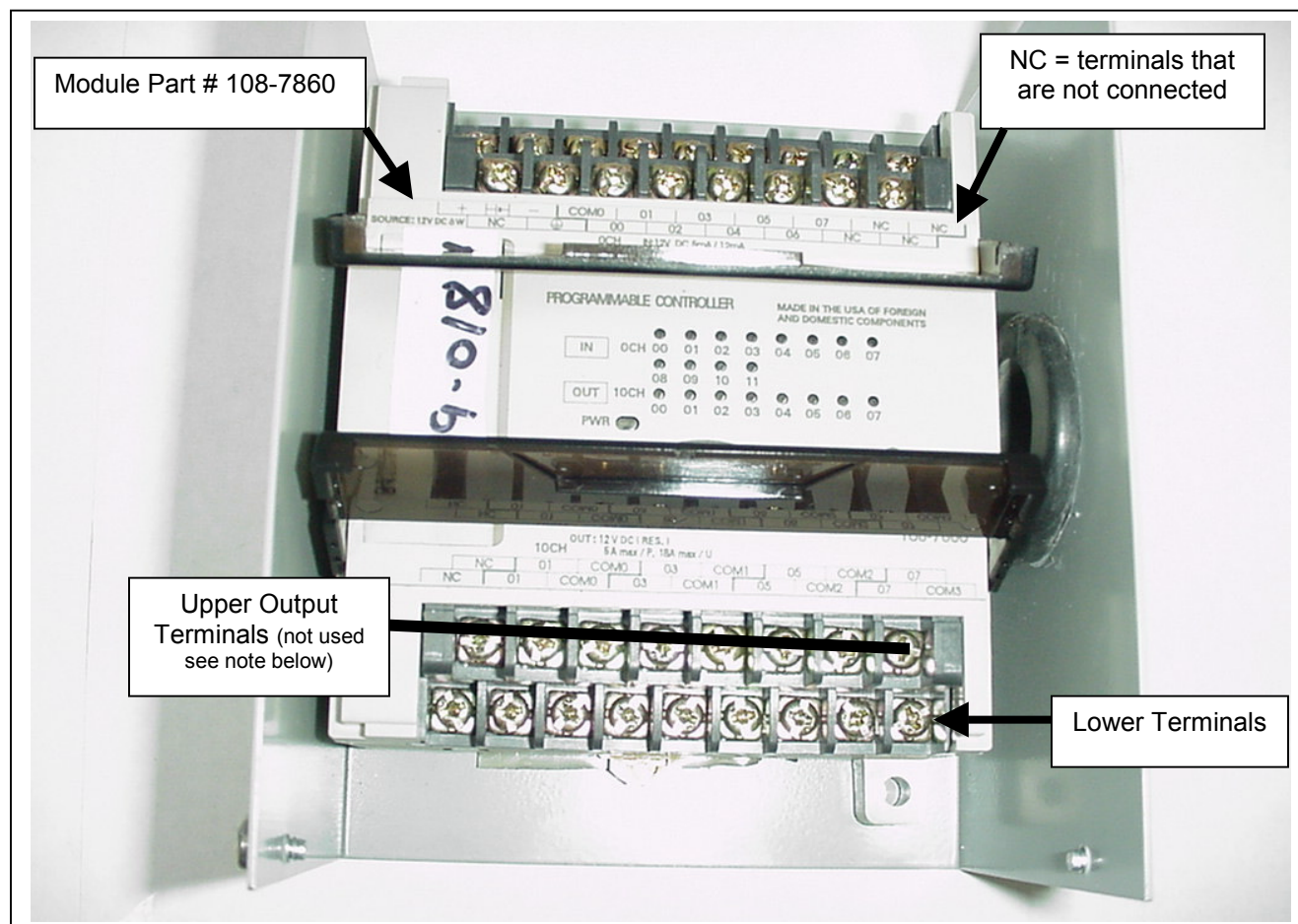
•REAR LOADERS



A  COMPANY

i







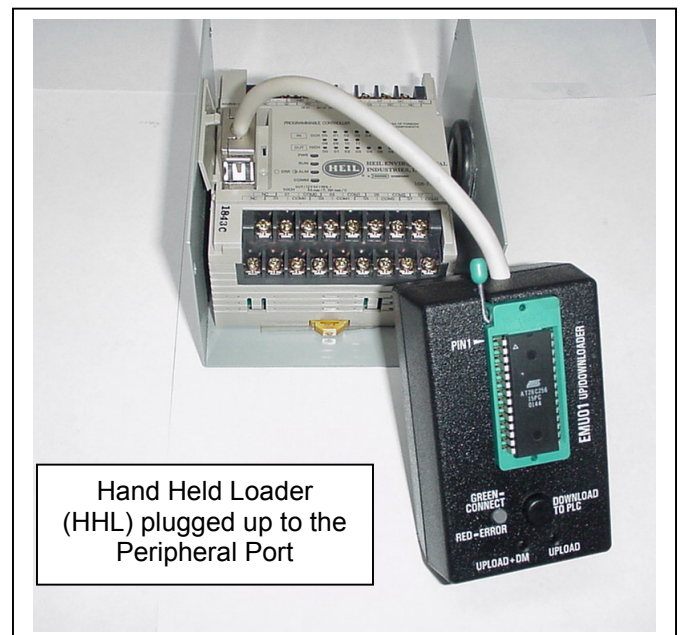
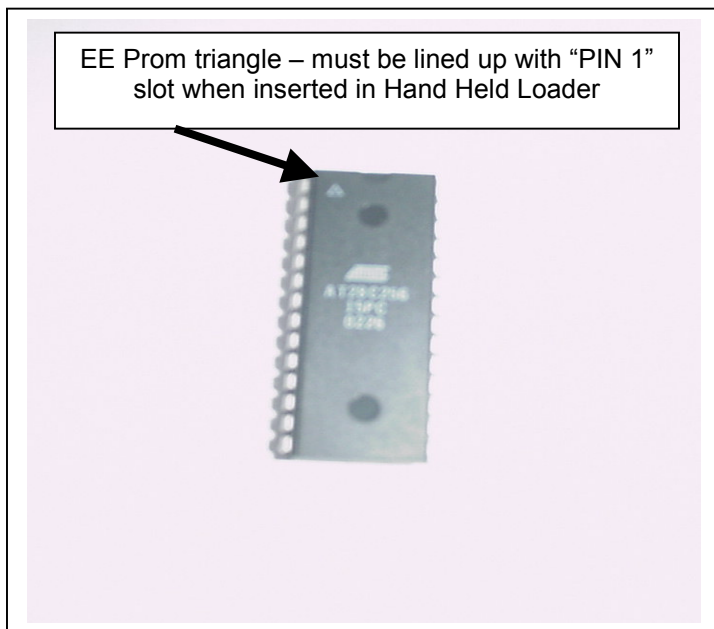
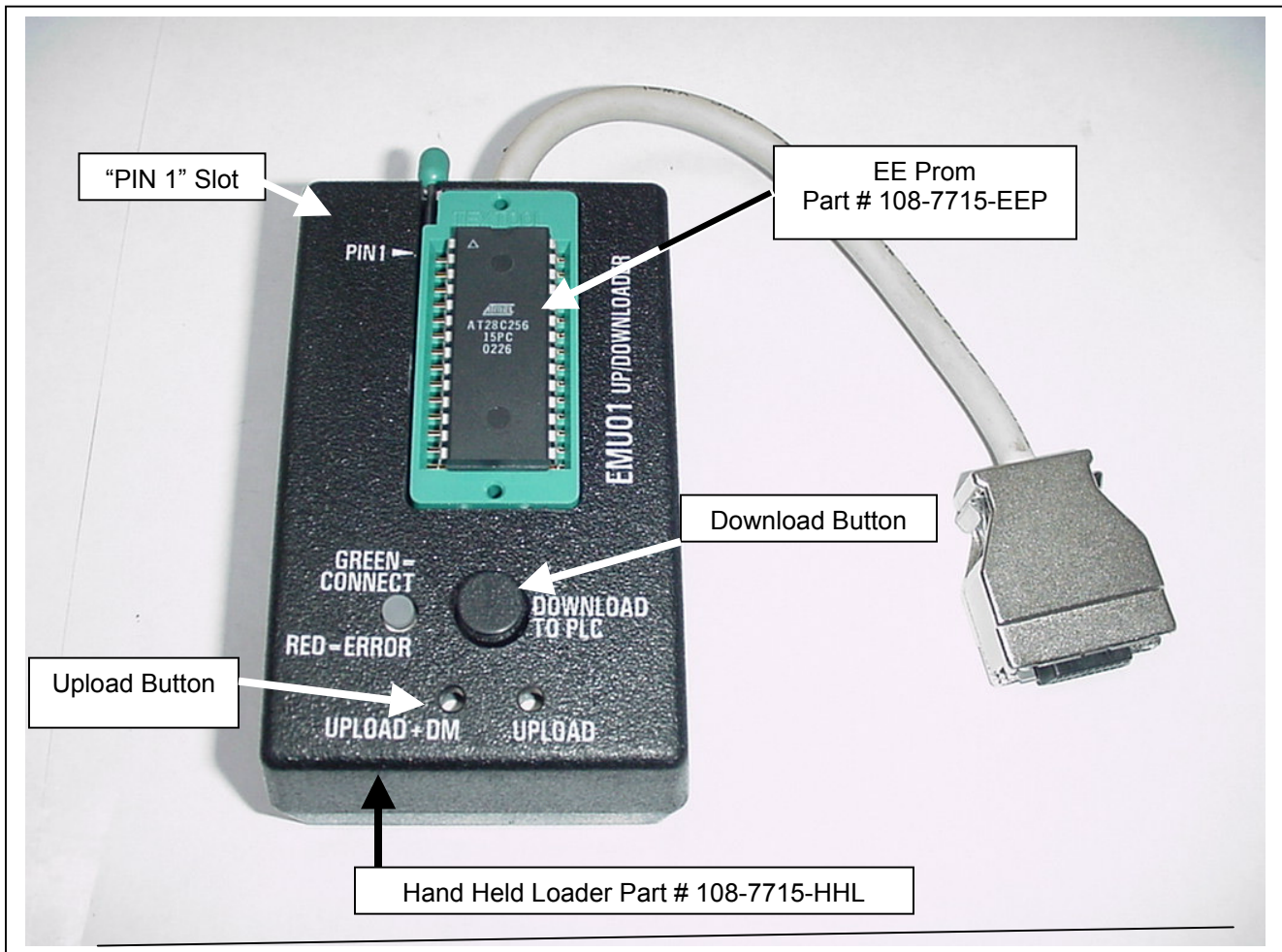
The Mini PLC component is used in various applications that require two electronic over speeds (EOS). This application is generally found on units using a tandem pump setup. The EOS screws are not activated and are not used. The EOS set points are part of the PLC program.

Note: The Mini PLC is a sourcing system that requires positive input signals.

Note: The PLC has a row of upper and lower input and output terminals on each side of the PLC module. The upper output terminals are not available and cannot be used.

Note: The mini PLC does not use a replaceable memory battery.

HEIL PLC HAND HELD LOADER PROGRAMER



HEIL MINI PLC PROGRAMMING PROCEDURES

Procedures for downloading program using the Hand Held Loader

- 1.) Install (108-7715-EEP) EE prom into (108-7715-HHL) loader by moving the locking lever up. Make sure you have an EE prom with the correct program.
- 2.) Place the EE prom into loader with the triangle next to the "PIN 1" location.
- 3.) Move the locking lever (down) to the locked position.
- 4.) Connect the HH loader to the PLC using the Peripheral Port located underneath the flip up cover.
- 5.) Turn on the ignition power. Note, the green light should be on.
- 6.) Press the Download to PLC button once and wait for the green light to stop flashing.
- 7.) Turn the ignition power off.
- 8.) After 5 seconds turn on the ignition power again. Note, the green light should be on.
- 9.) Press the Download to PLC button again and wait for the green light to stop flashing.
- 10.) Remove the HH loader from the PLC and the close cover. Program installation is complete

Procedures for uploading program using the Hand Held Loader

- 1.) Install (108-7715-EEP) EE prom into (108-7715-HHL) loader by moving the locking lever up.
- 2.) Place the EE prom into loader with the triangle next to the "PIN 1" location.
- 3.) Move the locking lever (down) to the locked position.
- 4.) Connect the HH loader to the PLC using the Peripheral Port located underneath the flip up cover.
- 5.) Turn on the ignition power. Note, the green light should be on.
- 6.) Press the Upload + DM (data memory) button once and wait for the green light to stop flashing.
- 7.) Turn the ignition power off.
- 8.) Remove the HH loader from the PLC and the close cover. Program upload to EE prom is complete

NOTE: There is no memory in the Hand Held Loader without the EE Prom installed.

Diagnostic Link

The Diagnostic Link referenced below is a hand held tool, which can be connected to the PLC through the peripheral port.

Reference document 800-0362.xls for the diagnostic link menu structure.

This Link can be used to achieve the following:

Complete the calibration setup for a newly installed PLC (*password required*)

Monitor input status

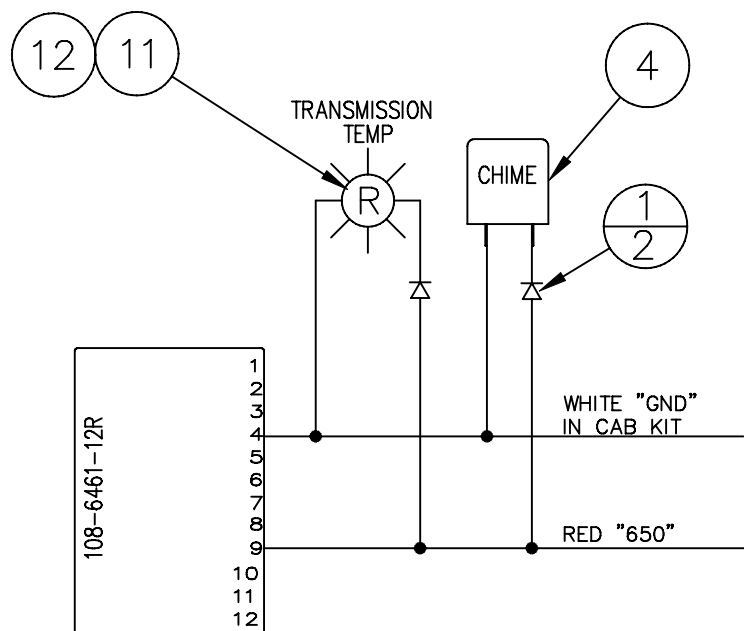
Monitor output status and test output device circuits by forcing outputs ON

View system parameters

Modify system parameters (*password required*)

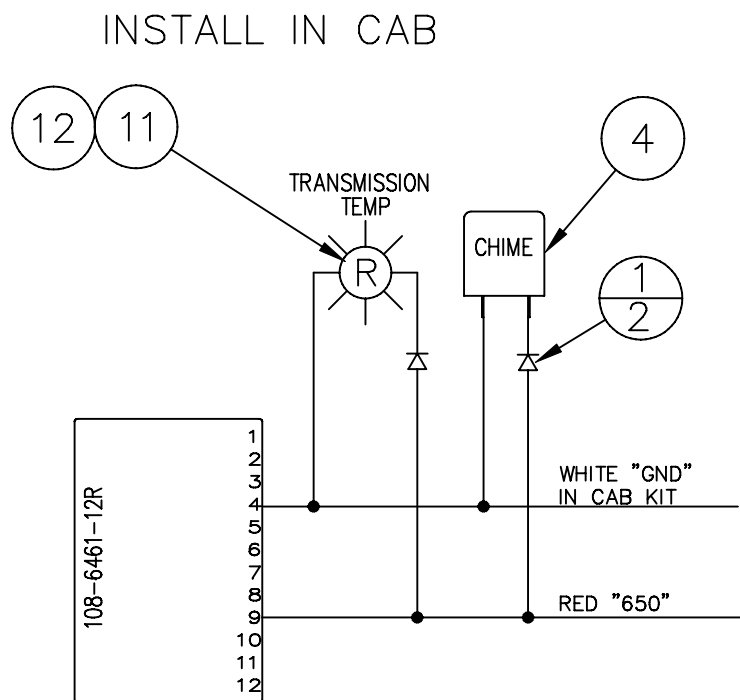
View faults as well as fault history

INSTALL IN CAB



REF.	PART No.	DESCRIPTION	QTY.
1	. 108-5632	DIODE	2
2	. 108-5717-001	CONNECTOR BUTT 18 GA	2
3	. 108-5717-002	CONNECTOR BUTT 16 GA	2
4	. 108-6189	CHIME	1
5	. 108-6461-101	PIN	1
6	. 108-6716-GND	WIRE 16 GA	36"
7	. 108-6718-904	WIRE 18 GA	36"
8	. 108-7583-038	HEAT SHRINK 3/8"	10"
9	. 108-7799	SWITCH TRANSMISSION TEMP	1
10	. 108-7919-004	KIT PRESSURE SWITCH, OIGAI	1
11	. 115-0766	LIGHT INDICATOR RED	1
12	. 212-2886-001	DECAL TRANS TEMP	1
13	. 212-2886-002	DECAL SYSTEM SPEED UP	3
14	. 372-1828-006	KIT MINI-PLC	1

**OPERATE-AT-IDLE ELECTRICAL KIT
372-2961**

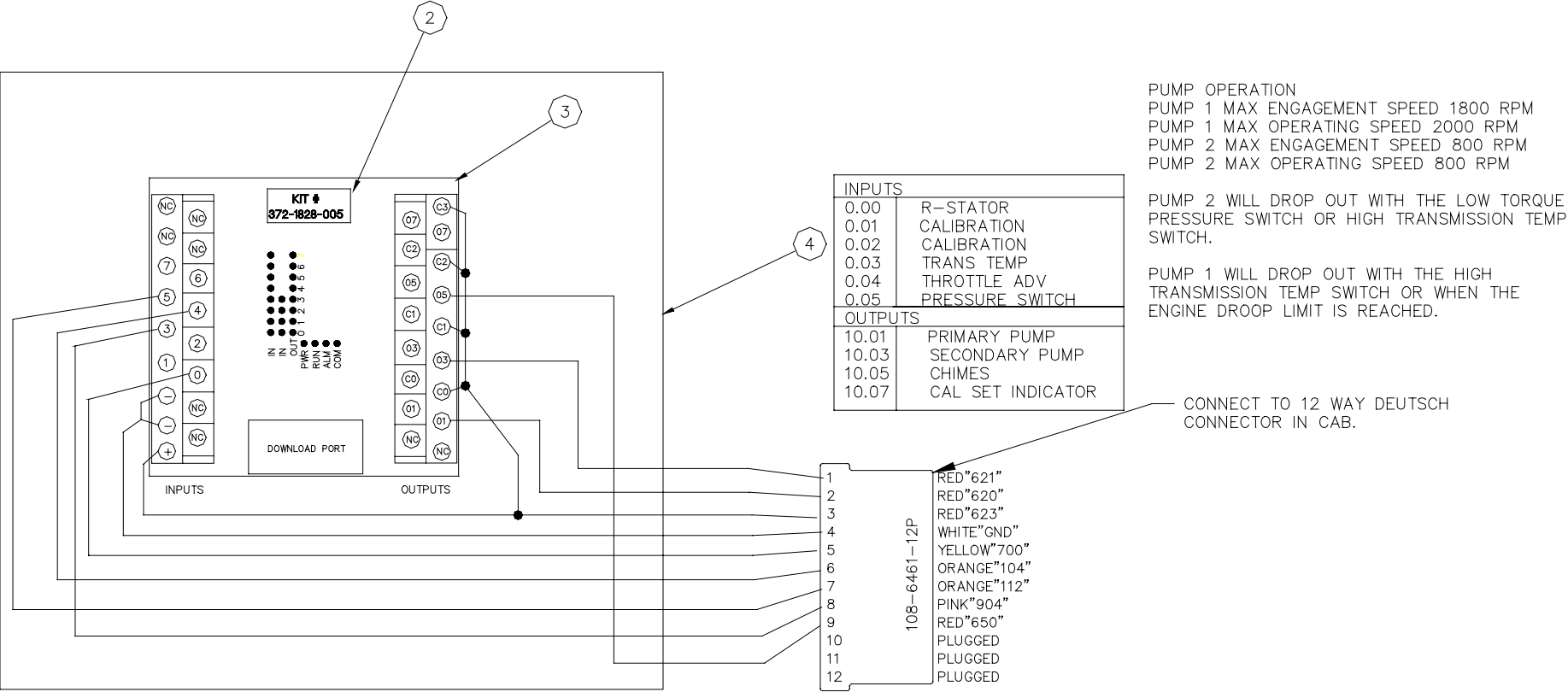


REF.	PART No.	DESCRIPTION	QTY.
1	. 108-5632	DIODE	2
2	. 108-5717-001	CONNECTOR BUTT 18 GA	2
3	. 108-5717-002	CONNECTOR BUTT 16 GA	2
4	. 108-6189	CHIME	1
5	. 108-6461-101	PIN	1
6	. 108-6716-GND	WIRE 16 GA	36"
7	. 108-6718-904	WIRE 18 GA	36"
8	. 108-7583-038	HEAT SHRINK 3/8"	10"
9	. 108-7799	SWITCH TRANSMISSION TEMP	1
10	. 108-7919-004	KIT PRESSURE SWITCH, OIGAI	1
11	. 115-0766	LIGHT INDICATOR RED	1
12	. 212-2886-001	DECAL TRANS TEMP	1
13	. 212-2886-002	DECAL SYSTEM SPEED UP	3
14	. 372-1828-008	KIT MINI-PLC	1

OPERATE-AT-IDLE ELECTRICAL KIT
372-2961-002

CALIBRATION INSTRUCTIONS
PLACE A JUMPER ACROSS INPUTS 0.01 AND
0.02. HOLD THE THROTTLE AT 1000 RPM.
AFTER 10 SECONDS OUTPUT 10.07 WILL LIGHT.
THIS INDICATES THE CALIBRATION PROCESS IS
COMPLETE. REMOVE THE JUMPER.

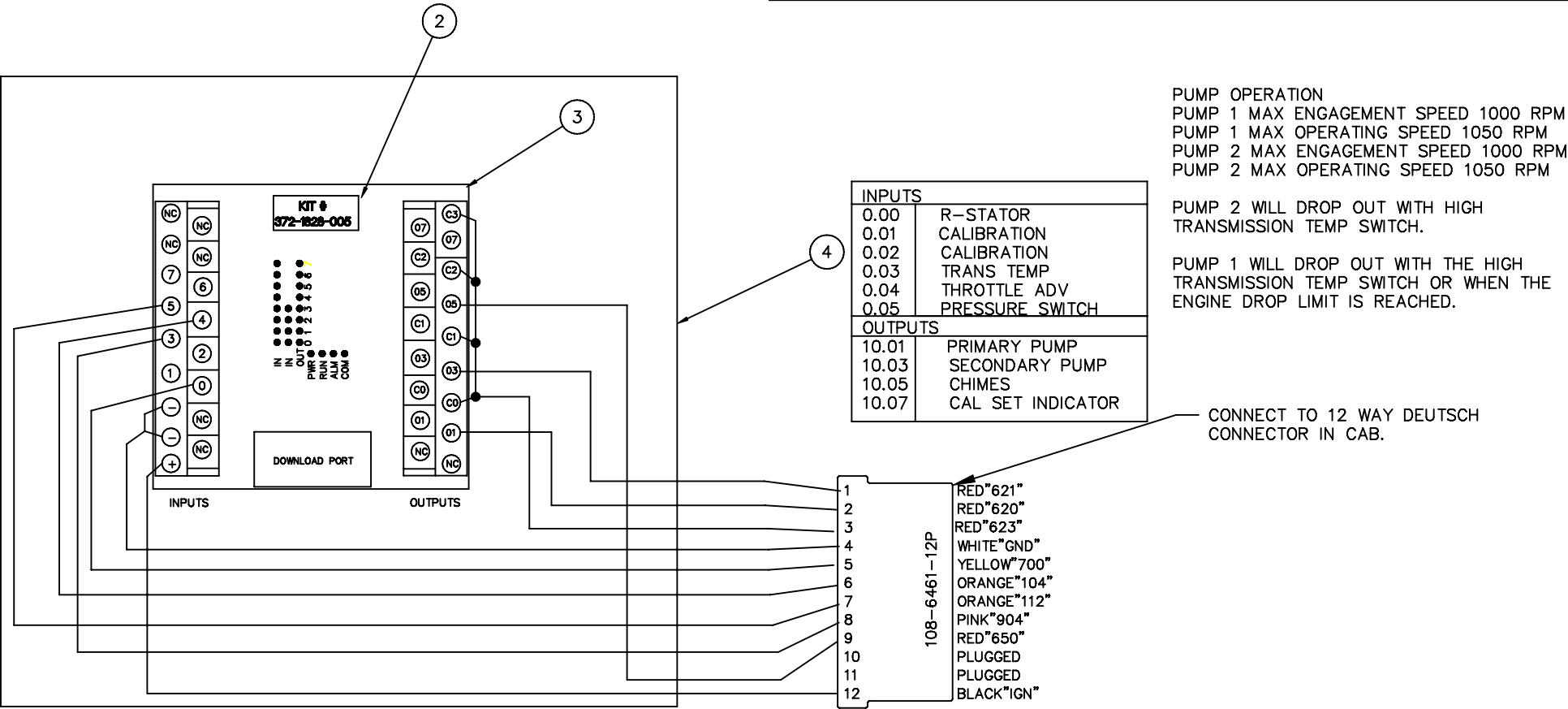
REF.	PART No.	DESCRIPTION	QTY.
1	. 109-0205-001	PLC PROGRAM	REF
2	. 212-2784-009	DECAL	1
3	. 108-7860	PLC OMRON MINI	1
4	. 372-1906	KIT BOX MINI PLC	1



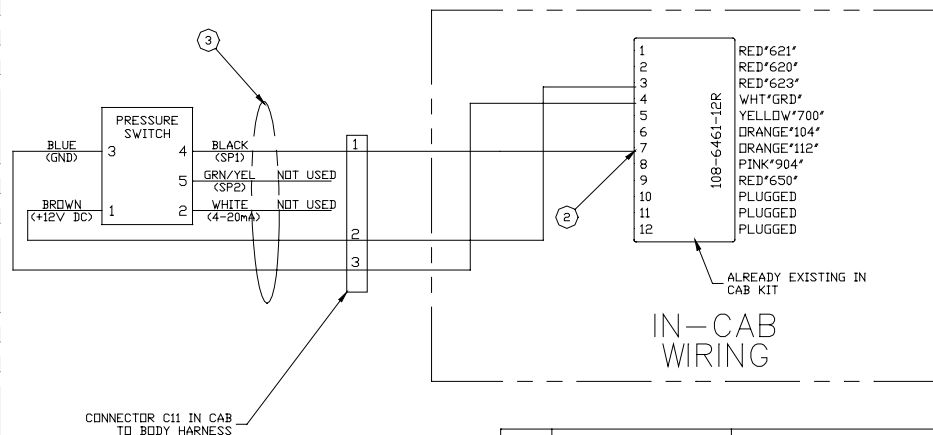
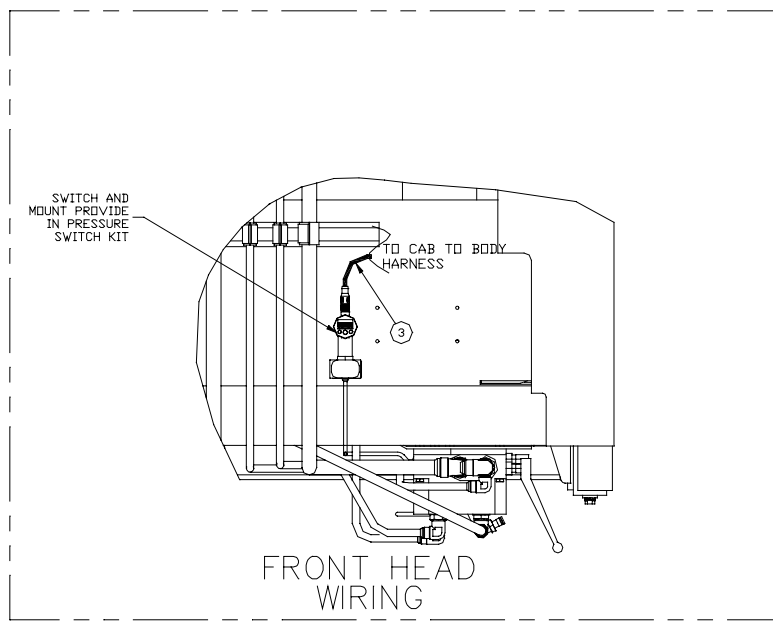
**MINI PLC KIT
REAR LOADER O-I-G-A-I
372-1828-006**

CALIBRATION INSTRUCTIONS
PLACE A JUMPER ACROSS INPUTS 0.01 AND 0.02. CONNECT 12 VOLT IGNITION SOURCE TO JUMPER. HOLD THE THROTTLE AT 1000 RPM. AFTER 10 SECONDS OUTPUT 10.07 WILL LIGHT. THIS INDICATES THE CALIBRATION PROCESS IS COMPLETE. REMOVE THE JUMPER.

REF.	PART No.	DESCRIPTION	QTY.
1	. 109-0224	PLC PROGRAM	REF
2	. 212-2784-009	DECAL	1
3	. 108-7860	PLC OMRON MINI	1
4	. 372-1906	KIT BOX MINI PLC	1



**MINI PLC KIT
REAR LOADERS O-A-I
LOW E.O.S.
372-1828-008**



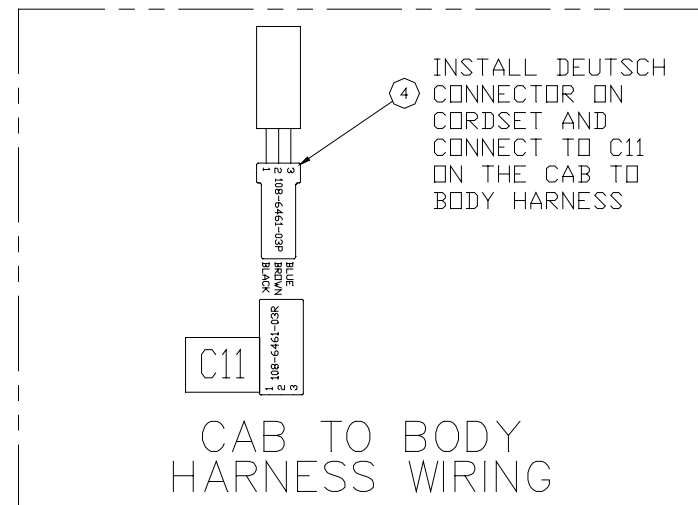
REF.	PART No.	DESCRIPTION	QTY.
1	. 054-7350	HEAT SHRINK	6"
2	. 108-6461-101	DEUTSCH PIN	1
3	. 108-7121-05M	CORD SET 5 WIRE (5M)	1
4	. 108-6461-001	DUETSCH PLUG 3 WAY	1
5	. 108-7583-075	HEAT SHRINK 3/4"	4"

NOTE: THIS KIT PROVIDES:

1. FOR THE DISENGAGING OF PUMP#1 WHEN SYSTEM PRESSURE REACHES THE PROGRAMMED PRESSURE SET POINT.
2. FOR THE REENGAGING OF PUMP#1 WHEN THE SYSTEM PRESSURE DROPS BELOW THE PROGRAMMED HYSTERESIS SET POINT.

SETUP PROCEDURE

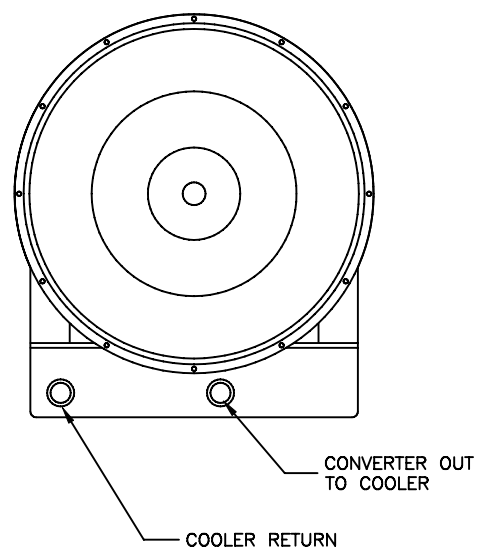
1. PRESS MODE BUTTON DURING POWER UP AND HOLD FOR 3 SECONDS UNTIL "Menu" IS DISPLAYED.
2. PRESS AND RELEASE MODE BUTTON UNTIL "rPnB" IS DISPLAYED. USE ARROW BUTTON TO SET TO "PS". (THIS SETTING CHANGES THE PRESSURE SWITCH TO READ IN PSI, DEFAULT IS BAR)
3. PRESS AND RELEASE MODE BUTTON UNTIL "End" IS DISPLAYED. USE ARROW BUTTONS TO SET TO "YES". (THIS STORES THE PROGRAM CHANGE)
4. WAIT 3 SECONDS, PRESS MODE BUTTON UNTIL "SP1" IS DISPLAYED. USE ARROW BUTTONS TO SET TO "2000". (THIS SETS SWITCH OUTPUT #1 TO TRIGGER AT 2000PSI).
5. PRESS AND RELEASE MODE BUTTON UNTIL "HYSP" IS DISPLAYED. USE ARROW BUTTONS TO SET TO "700". (THIS SETS THE HYSTERESIS TO KEEP THE SWITCH TRIGGER UNTIL THE PRESSURE DROPS 700PSI BELOW THE VALUE IN SP1).
6. VERIFY OPERATION OF THE UNIT, IF THE ENGINE CONTINUES TO STALL DECREASE THE "SP1" SET POINT IN INCREMENTS OF 100 UNTIL ENGINE NO LONGER STALLS.
7. VERIFY THAT THE PACKER PUMP DOES NOT DISENGAGE AND RENGAGE MULTIPLE TIMES WITH EACH PRESSURE SWITCH ACTIVATION. IF THIS DOES OCCUR DECREASE THE "HYSP" SET POINT IN 100 PSI INCREMENTS UNTIL OCCURRENCES STOP.



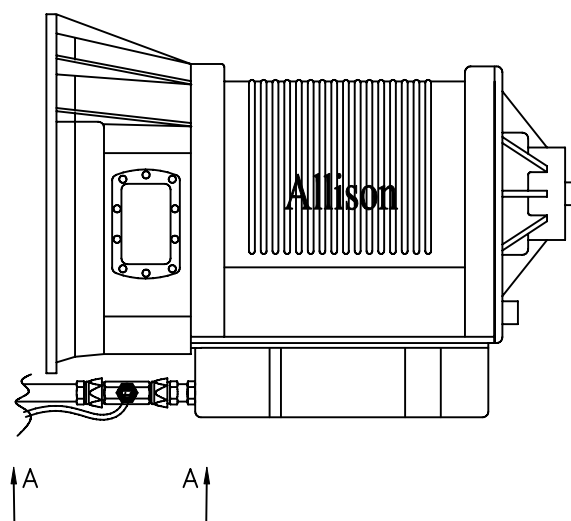
**PRESSURE SWITCH KIT
REAR LOADER (O-I-G-A-I)
108-7919-004**

REF.	PART No.	DESCRIPTION	QTY
1	. 054-7350	SHRINK TUBING	2"
2	. 069-0032	RELAY MICRO	1
3	. 108A470	WIRE LOOM	10'
4	. 108-5717-002	BUTT CONNECTOR	1
5	. 108-6461-011	2 PIN PLUG, DEUTSCH DT	1
6	. 108-6461-012	2 PIN RECEPT, DEUTSCH DT	1
7	. 108-6718-IGN	WIRE 16 AWG (BLACK "IGN")	10'
8	. 108A6718-902	WIRE 18AWG (PINK "902")	10'
9	. 108A6718-903	WIRE 18AWG (PINK "903")	10'
10	. 108-6718-904	WIRE 18 AWG PINK "904"	10'
11	. 108A7571	TEMPERATURE SWITCH N.C.	1
12	. 212-2777-006	DECAL TRANS TEMP	1
13	. 354-1934	FITTING, 1"JIC-1"JIC W/1/4"NPT SPUD	1

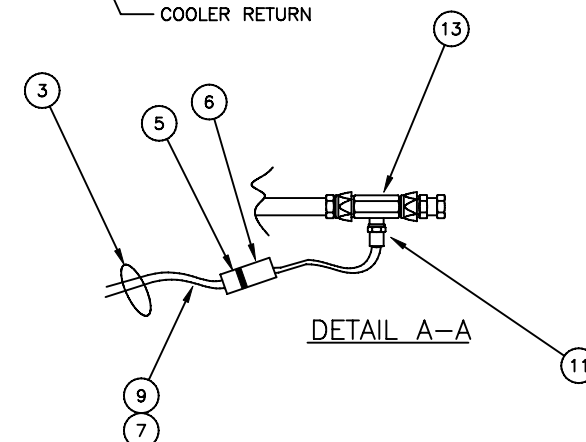
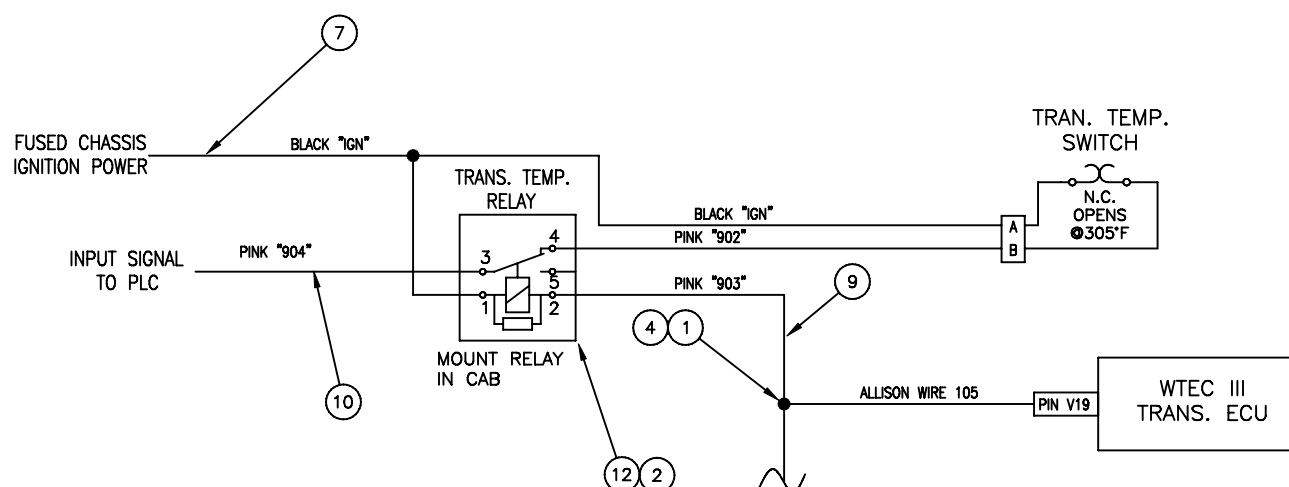
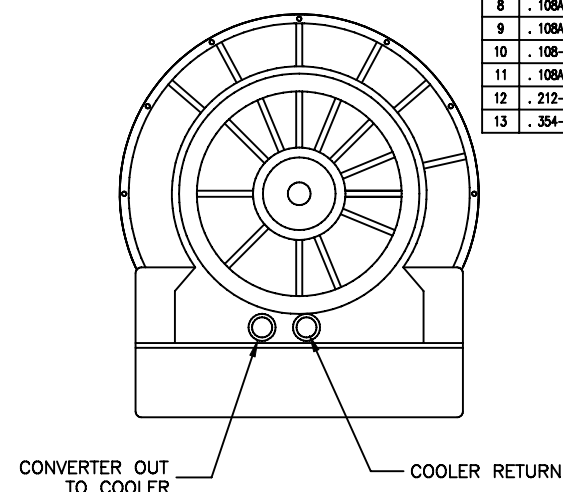
FRONT VIEW
WTECK TRANS.



REET SIDE VIEW
WTECK TRANS.



REAR VIEW
WTECK TRANS.

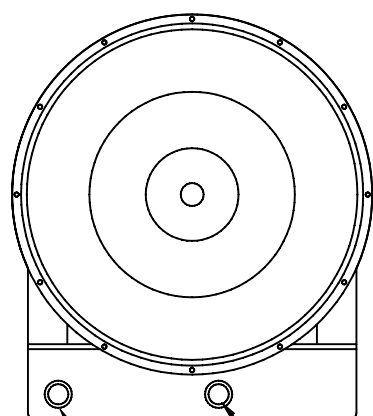


NOTE: THE ALLISON TRANSMISSION COOLER LINES MAY EXIT FROM EITHER THE FRONT OR REAR OF THE TRANSMISSION.
THE TEMPERATURE SWITCH P/N 108-7571 MUST BE INSTALLED INTO THE CONVERTER-OUT LINE GOING TO THE TRANSMISSION COOLER.

**TEMPERATURE SWITCH INSTALL - SOURCING
ALLISON WTEC CONVERTER OUT
108-7799**

REF.	PART No.	DESCRIPTION	QTY
1	. 054-7350	SHRINK TUBING	2"
2	. 108A7571	TEMPERATURE SWITCH N.C.	1
3	. 108A4470	WIRE LOOM	10'
4	. 108-5717-002	BUTT CONNECTOR	1
5	. 108-6461-011	2 PIN PLUG, DEUTSCH DT	1
6	. 108-6461-012	2 PIN RECEPT. DEUTSCH DT	1
7	. 108-6716-IGN	WIRE 16 AWG (BLACK "IGN")	10'
8	. 108A6718-902	WIRE 18AWG (PINK "902")	10'
9	. 108A6718-903	WIRE 18AWG (PINK "903")	10'
10	. 354-1934	FITTING, 1"JIC-1"JIC W/1/4"NPT SPUD	1

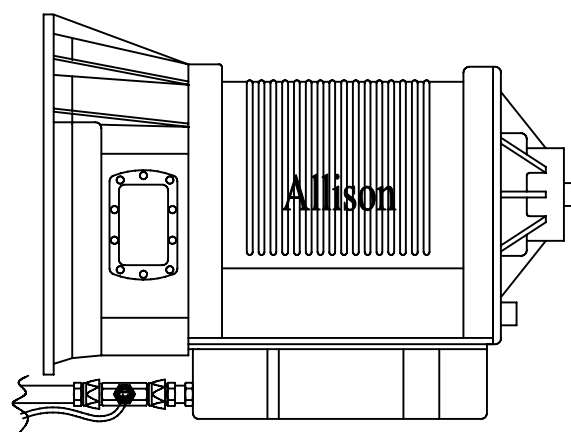
FRONT VIEW
WTECK TRANS.



CONVERTER OUT
TO COOLER

COOLER RETURN

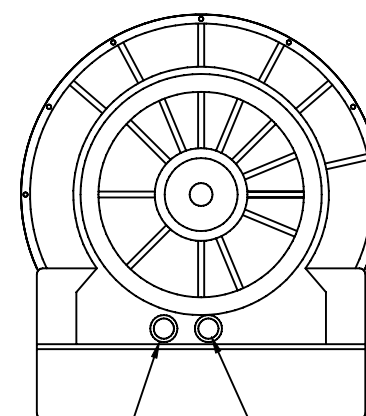
REET SIDE VIEW
WTECK TRANS.



A

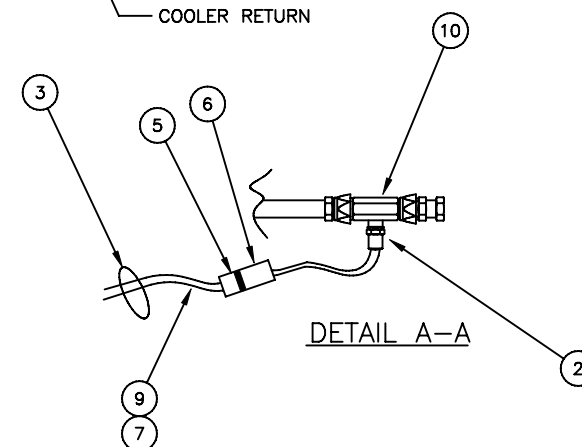
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REAR VIEW
WTECK TRANS.



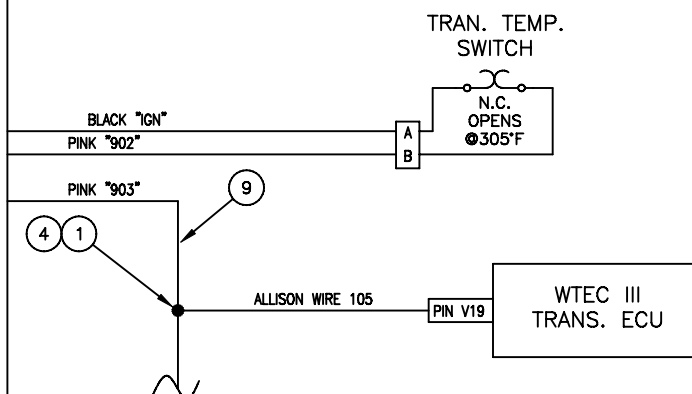
CONVERTER OUT
TO COOLER

COOLER RETURN



DETAIL A-A

CONTROL BOX



NOTE: THE ALLISON TRANSMISSION COOLER LINES
MAY EXIT FROM EITHER THE FRONT OR REAR
OF THE TRANSMISSION.
THE TEMPERATURE SWITCH P/N 108-7571
MUST BE INSTALLED INTO THE CONVERTER-OUT
LINE GOING TO THE TRANSMISSION COOLER.

**TEMPERATURE SWITCH INSTALLATION - SOURCING
ALLISON WTEC CONVERTER OUT
108-7799-001**

SECTION 5

BODY

SERVICE MANUAL

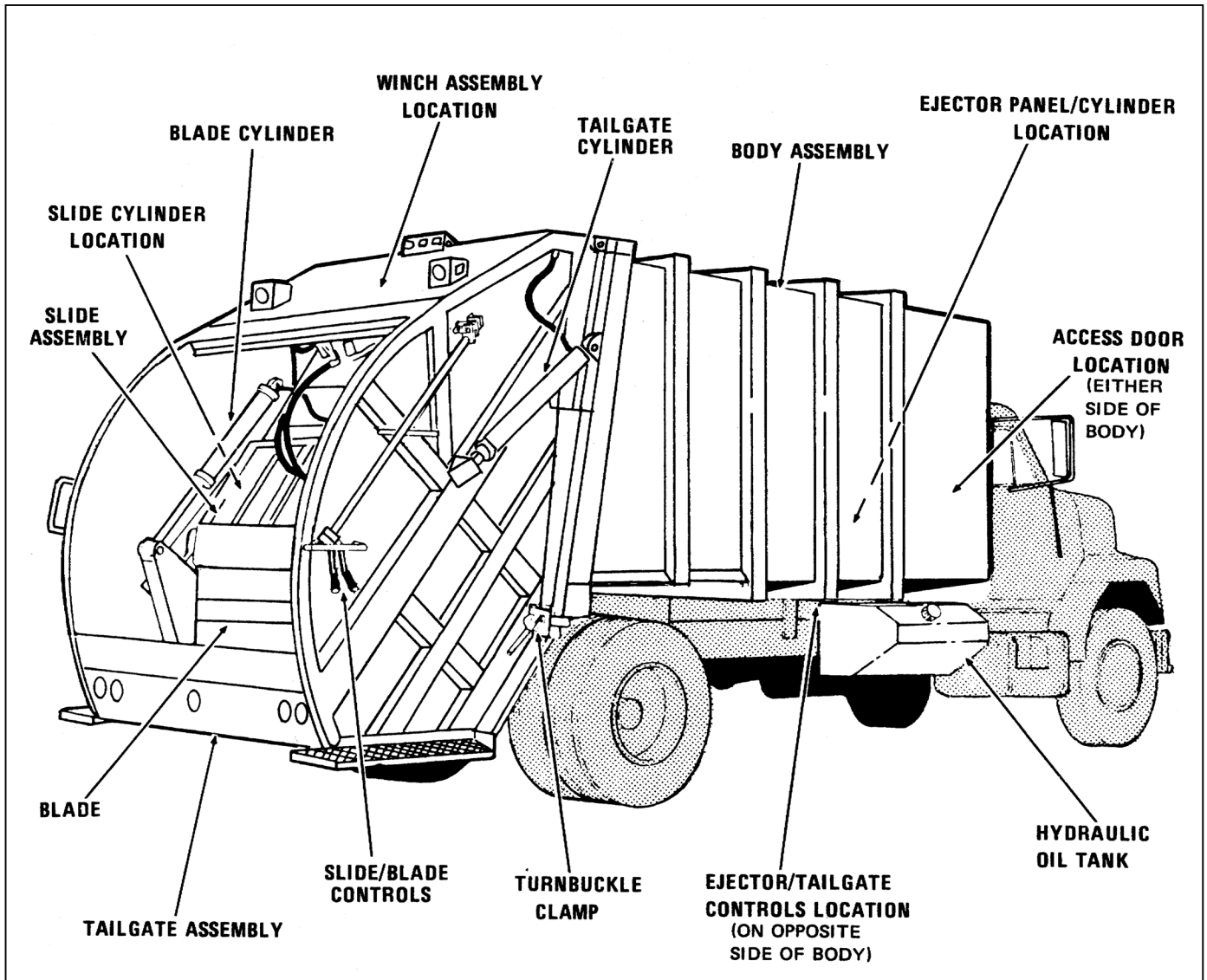


A  COMPANY

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NOMENCLATURE



SPECIFICATIONS

Hydraulic Oil Tank	24 Gal.
Hydraulic Oil System Capacity.....	36-1/2 Gal.
Return Line Oil Filter	10-Micron
Optional In-Tank Oil Filter.....	5-Micron
Hydraulic Tank Suction Strainer.....	140 Mesh Screen
Hydraulic Cylinders:	
Ejector;	
11 cu. yd.narrow & 13 cu. yd. std.	Telescopic x 65.12" stroke
14 cu. yd.narrow & 16 cu. yd. std.	Telescopic x 81.62" stroke
16 cu. yd.narrow & 18 cu. yd. std.	Telescopic x 96.50" stroke
18 cu. yd.narrow & 20 cu. yd. std.	Telescopic x 110.34" stroke
25 cu. yd. std.	Telescopic x 129.34" stroke
Main System Relief Valve Pressure	2500 + 50/-0 PSI
Ejector Duo Press Relief Valve;	
13 – 18 yd. units	1400/800 PSI
20 yd. units	1400/600 PSI
25 yd. units	1400/550 PSI

PREVENTIVE MAINTENANCE CHART

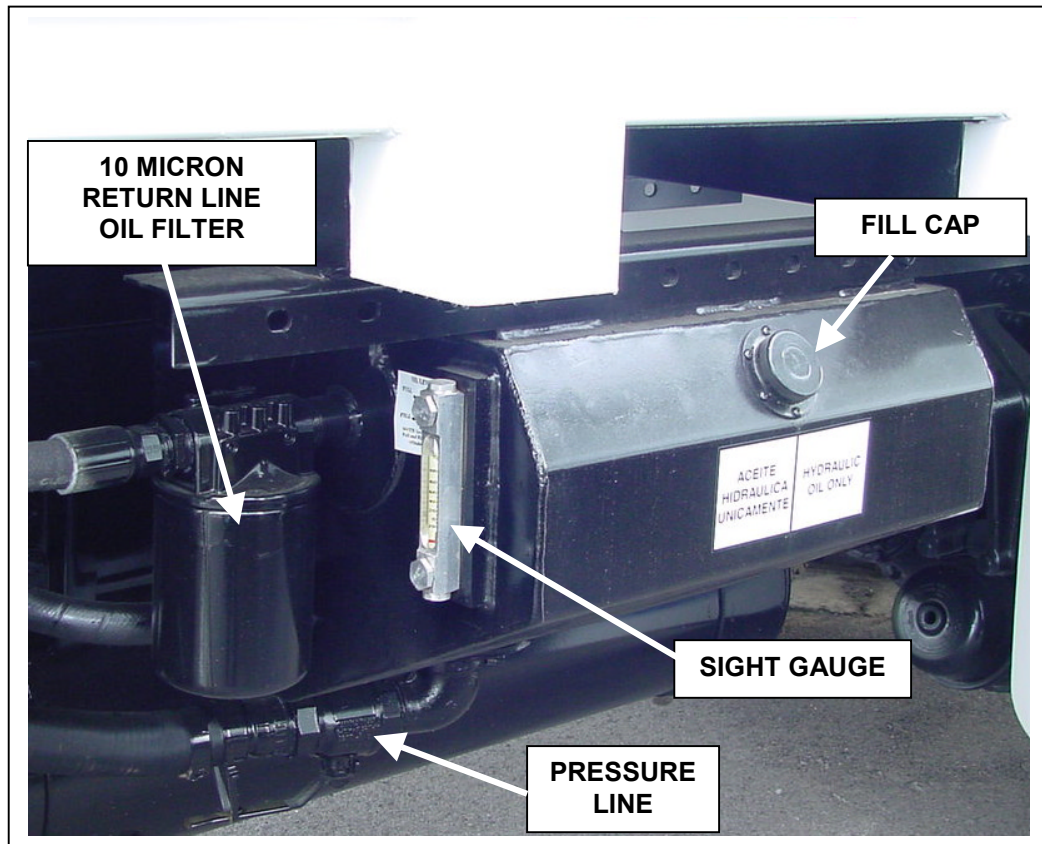
MAINTENANCE INTERVALS

Normal maintenance done according to an established schedule is preventive maintenance. On this equipment, preventive maintenance involves machine lubrication and normal maintenance intervals given in this manual are based on an 8-hour day and average operating conditions. Severe use or adverse conditions make it necessary to do this maintenance more frequently.

Ref.	Component/System	<div> Daily-8 Hours Weekly-40 Hours 2 Months-400 Hours 12 Months-2000 Hours </div>				Service/Check
1.	Hydraulic System	X				Check oil level in tank & refill
			X			Check cylinders, pump & system for leaks; repair/replace if necessary
			X			Check control valve seals for leaks, repair/replace if necessary
				X		*Replace filter
					X	Replace tank breather
					X	Drain, flush & refill, change filter
2.	Lights & Wiring	X				Check wiring, battery cables for wear & proper operation
3.	Operator's Control	X				Check for proper operation
4.	Front Mount Pump or Power Take Off (if so equipped)		X			Check seals for leaks & operation
			X			Check driveline for smooth operation Check setscrews for tightness & that keys are in place
5.	Grease Fittings		X			Lubricate (See Chart on page 9.8)
6.	Control Linkage		X			Check & make sure all cotter pins are in place
7.	Packing Mechanism, Tailgate & Body	X				Check & remove any accumulation of refuse in front of packer panel
			X			Check tailgate seal for damage or missing gasket
			X			Check pivot pins retaining capscrews for tightness
8.	Throttle Stop Device				X	Check & adjust if necessary
9.	Winch (Option)			X		Check oil level, add gear oil if necessary.

*Replace filter after first month of operation, then every two months thereafter.

NOTE: UNITS EQUIPPED WITH OPTIONAL CONTAINER MECHANISM AND/OR WINCH MECHANISM
When a newly installed wire rope has been in operation for an hour, all nuts on the clip bolts shall be retightened, and checked for tightness at frequent intervals thereafter.

STANDARD HYDRAULIC OILTANK

This is the standard hydraulic oil tank with the 10-micron oil filter. It is normally located on the streetside (left side) of the unit.

An optional oil tank with in-tank oil filter is used when unit has a front mount pump or reeving cylinder.

OIL LEVEL CHECKING PROCEDURE

Check the oil level daily or every 8 hours, whichever comes first.

IMPORTANT!

Contamination is the worst enemy of any hydraulic system. Keep dirt from entering the system. Clean around any system component before disconnecting or removing it. When filling the tank, filter the oil through a 200 mesh (or finer) screen. NEVER use a cloth to filter the oil.

HYDRAULIC OIL TANK

Before checking the oil level, make sure the unit is in the following position:

1. **Chassis** – on level ground.
2. **Ejector panel** – at the front of the body.
3. **Tailgate** – is down and latched.
4. **Tailgate Packing Mechanism** – is in the starting position (Refer to operator's manual).

The oil level in the standard oil tank should be kept between the full and low marks as indicated on the decal by the sight gauge.

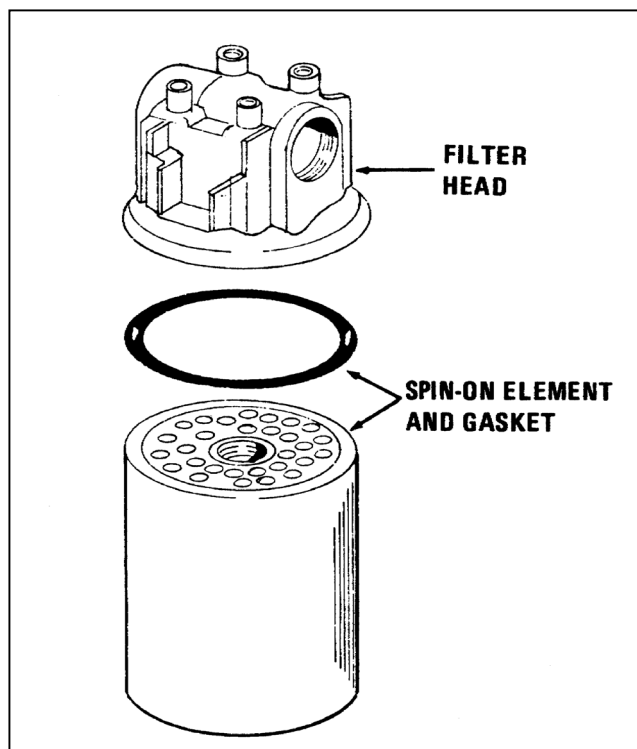
CHANGING THE FILTER ELEMENT**NOTE:**

Change the filter more often under certain conditions, such as extremely dusty atmosphere or area. Use only HEIL replacement filters, which may be ordered from your local Heil Distributor.

The element needs to be changed every 1000 hours or every 6 months or when indicated by the filter monitor light in the chassis cab.

Follow these steps;

1. Remove and discard spin-on element.
2. Remove and discard gasket and clean gasket groove.
3. Apply film of clean oil to gasket and install in gasket groove.
4. Screw on new element until it contacts the gasket. Tighten by hand 1/4 to 1/3 turn more.
5. Check for leaks with pump operating.



**OPTIONAL HYDRAULIC OIL FILTER –
5 MICRON
UNITS JULY 2004 AND AFTER – 075-0912**

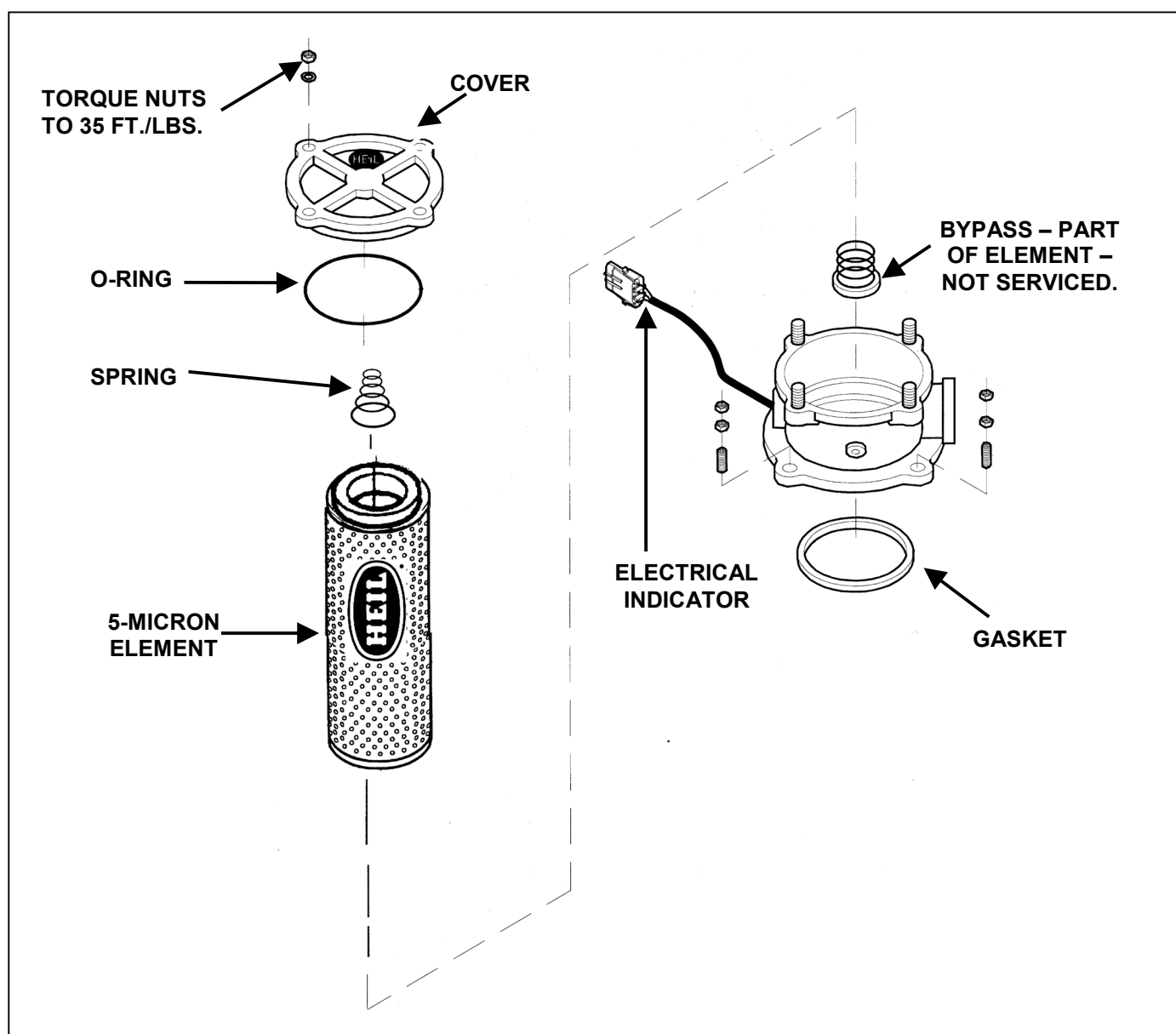
Change element as follows – (with unit in shutdown).

1. Remove nuts and cover.
2. Remove element (with by-pass assembly) and discard in a safe environmental way.
3. Clean housing with a lint free cloth.
4. Check o-ring and gasket and replace if necessary.

5. Lubricate all o-rings and gaskets.

7. Install new element.

8. Reinstall cover with nuts (torque nuts to 35 ft/lbs.).



DRAINING AND CLEANING PROCEDURES

The hydraulic oil should be changed at least annually, or every 2000 hours of operating time, whichever comes first.

It must be remembered that almost all hydraulic system malfunctions can be traced to dirt in the fluid. When working with the hydraulic system, the hands, tools, working area and parts must be kept as clean as possible. Drain the hydraulic system fluid as follows:

! DANGER

Hydraulic systems are highly pressurized. Escaping hydraulic oil, even an invisible pinhole leak, can penetrate body tissues causing serious injury. Use a piece of wood or cardboard when looking for leaks — never use the hands or other parts of the body.

Relieve hydraulic pressure before disconnecting circuits. When reassembling make absolutely certain all connections are tight.

If injured by hydraulic oil escaping under pressure, see a doctor immediately. Serious complications may arise if medical attention is not given at once.

1. Disengage the pump, shut off the engine and remove the ignition key.
2. Remove the fill cap from the top of the tank and then the drain plug from the bottom of the tank.
3. While fluid is draining from the tank, remove and replace the filter/breather assembly. This should be changed every time the in-tank filter is replaced.
4. The easiest and most effective way to drain the entire hydraulic system is to disconnect all hoses at the adapter and allow oil to drain into a suitable container.
5. Remove and replace the in-tank filter as described under "Changing the Filter Element".
6. Remove the outlet flange and 100 mesh suction strainer to gain access to the inside of the tank. Remove sediment from bottom of the tank.

7. Install the outlet flange with a new gasket and the 100 mesh suction strainer into the tank. Install the drain plug into the bottom of tank.

8. Reconnect and tighten all hose connections that were disconnected.

9. Fill tank with recommended oil checking the sight gauge (Refer to "Oil Level Checking Procedure").

NOTE: Before filling tank, make certain the funnel is clean and a 200 mesh (or finer) screen is used to strain the hydraulic oil.

10. Check the entire system to make sure all connections are tight and no leaks are found.

11. Start the truck's engine and engage the pump.

WARNING

Be sure all individuals are clear of any moving parts, mechanisms or components of the unit before actuating controls. During any such operation, be attentive at all times and be ready to stop or reverse the function.

12. Operate the packing panel through 10 cycles to be sure all air is removed from the circuits.
13. Operate the Tailgate — full up and full down.
15. With the packing mechanism in the retracted position, check the tank oil level. If necessary, add recommended oil as required.

TO PURGE THE HYDRAULIC SYSTEM

In the event the hydraulic system becomes contaminated due to component failure or other causes, the following procedure should be used to purge the system.


1. Extend the packer/ejector cylinder to lower the oil level in the tank.
2. Remove and replace the in-tank oil filter element in the tank.
3. Engage the packer/ejector control lever and allow the oil to circulate through the new filter, cleaning the oil.

IMPORTANT: Do not operate any other hydraulic component during this procedure.


4. Repeat the procedure as necessary until the system is purged.
5. If more information is needed, contact the Heil field service department. If the contamination has reached the cylinders, a complete take-down may be necessary.

SIDE ACCESS DOOR

A hinged access door is located on the street side of the unit and provides access to the body area for cleanout purposes. It should never be entered unless the truck engine is stopped and the ignition key removed and the unit is in lock-out/tag-out position.

**DANGER**

Before entering the body area, place the unit in LOCK-OUT. To place unit in LOCK-OUT, stop the engine, set the brakes and make sure the brakes are holding and working properly, chock all wheels, remove the keys from the cab and insert a LOCK-OUT tag onto steering wheel.

**DANGER**

Keep access door closed when packer/ejector is in operation and in motion. Failure to do so may result in injury or death.



**SIDE
ACCESS DOOR**

PRIMARY (BODY) VALVE

The primary valve, see Figure 22A, performs the same function and purpose as the valve used on earlier units. This valve differs as it is a four piece sectional valve and the earlier units used a monoblock valve.

BEFORE STARTING ADJUSTMENTS

1. Hydraulic oil must be at or near operating temperature before attempting pressure adjustments. If underbody (primary) valve does not feel warm to the hand, warm oil by:
 - A. Locking the tailgate
 - B. Pressing throttle advance button
 - C. Moving ejector panel out/in through 5 cycles
 - D. Run tailgate packing mechanism through 10 cycles.

2. Install accurate 0-3000 PSI glycerine filled pressure gauge into 1/4" NPT port on elbow going into valve inlet section, see figure 22B.
3. Remove any dirt and grease around body valve two stage relief valve.

MAIN RELIEF VALVE

The main relief is set at 2500 PSI and is adjusted, using the same procedure as the earlier monoblock valve. See Figure 22A for main relief location.

NOTE: ALL ADJUSTMENTS MUST BE MADE WITH THROTTLE ADVANCE SWITCH DEPRESS.

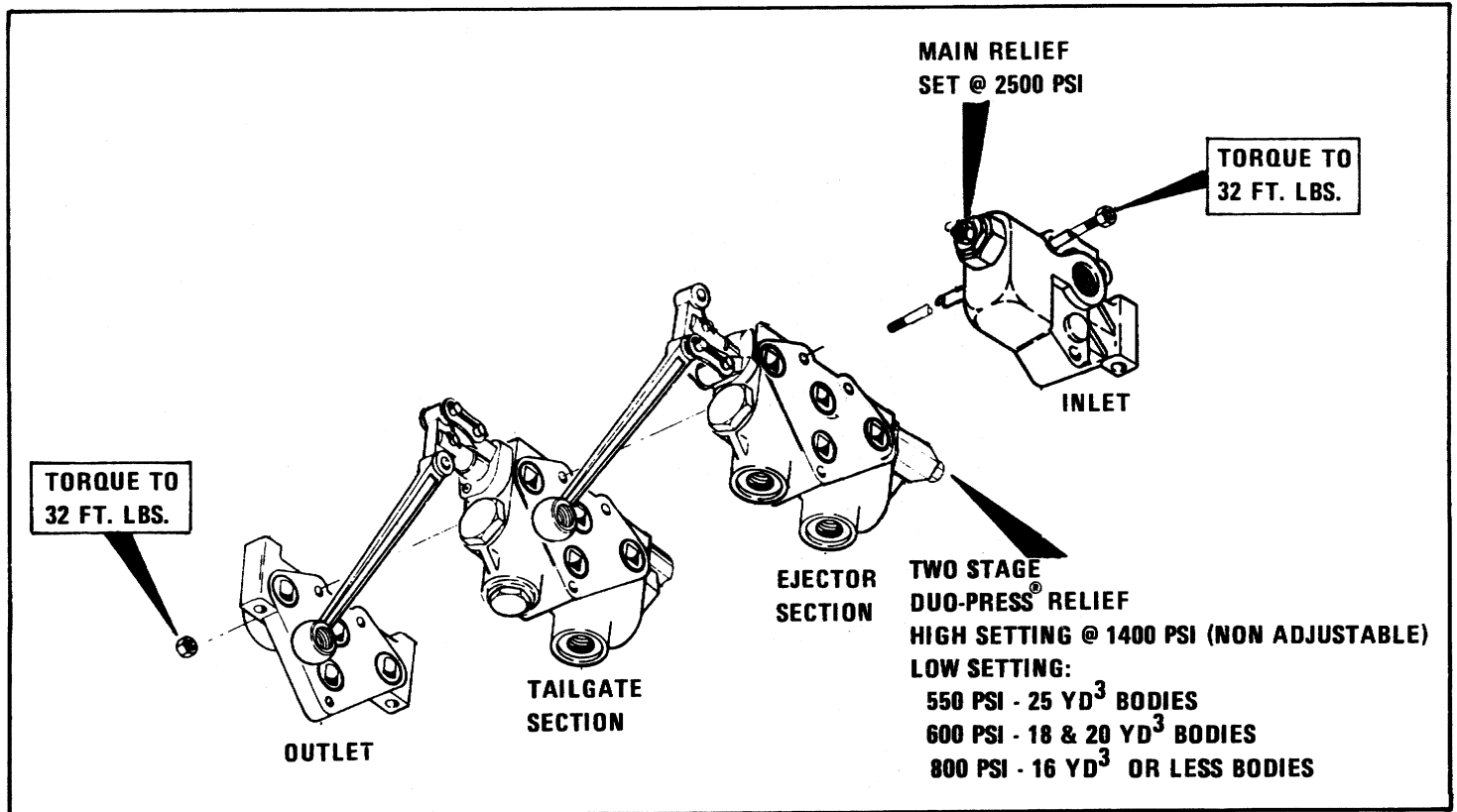


Figure 22A. Primary (Underbody) Valve

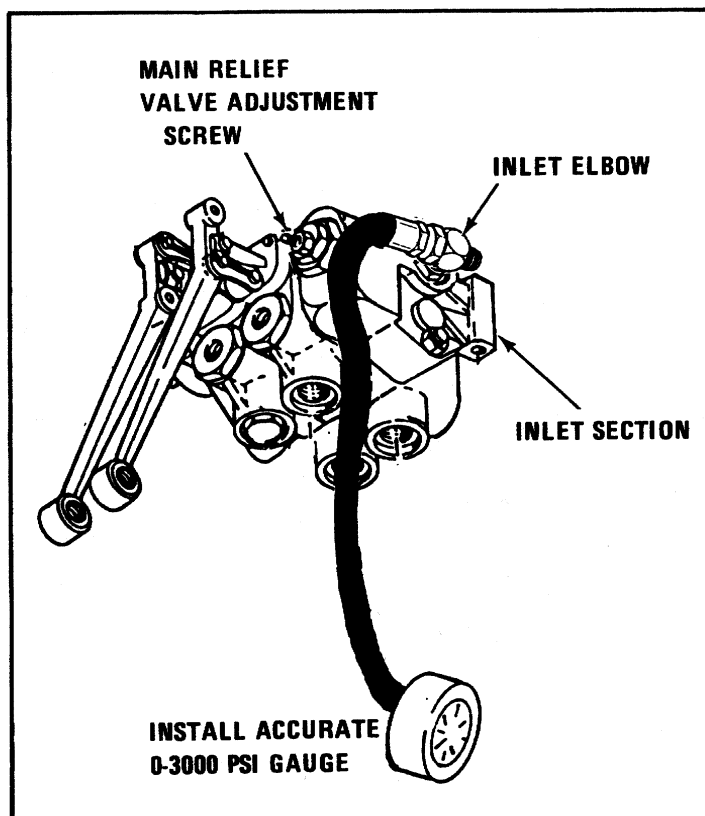


Figure 22B.

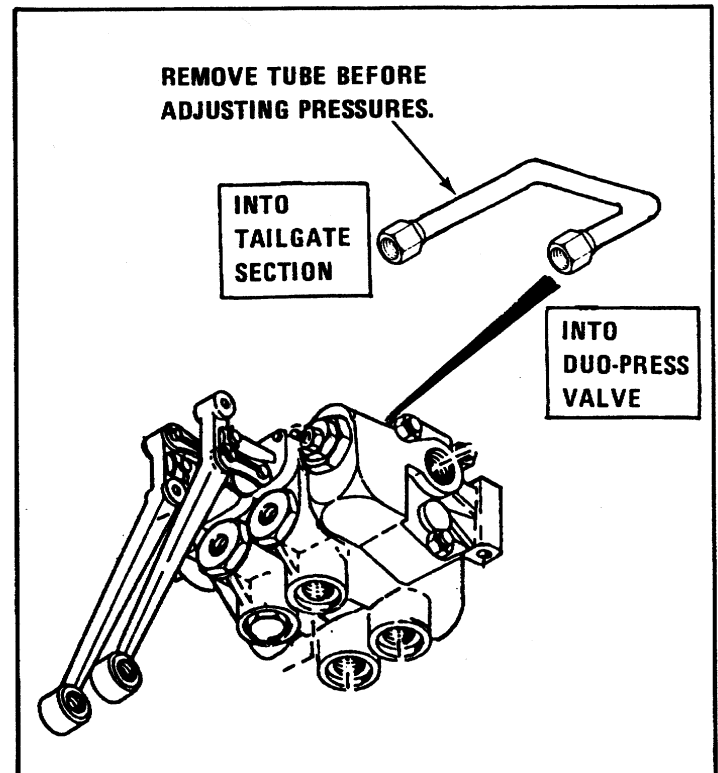


Figure 22C.

TWO STAGE RELIEF VALVE

The two stage Duo-Press® relief used in the sectional valve differs from relief used on the earlier valve as it is only necessary to adjust the LOW setting. The HIGH setting is pre-set at 1400 PSI.

The low settings are set according to the size of the body. These pressures are:

- 550 \pm $\frac{50}{0}$ PSI on 25 yd³ bodies.
- 600 \pm $\frac{50}{0}$ PSI on 18 and 20 yd³ bodies.
- 800 \pm $\frac{50}{0}$ PSI on 16 yd³ or less bodies.

CHECKING LOW PRESSURE SETTING

1. Release any pressure from the tailgate circuit by pulling tailgate control lever "lower position."
2. Start engine, engage the pump (or PTO) and lock the tailgate to the body using the screw clamps.
3. Pull ejector control lever to extend the ejector panel to bottom out the cylinder.
4. At engine idle, read the pressure on pressure gauge. It should read correct PSI for your size body - see listing above.

NOTE

Trucks with Allison Transmissions may be equipped with neutral lock-up (generally for low engine speed applications.) These trucks must have the throttle advance linkage disconnected (see figure 16 and 17. The outside throttle switch must be held while checking pressure, since the neutral lock-up device must be engaged to keep the transmission from slipping under hydraulic load at engine idle. When test is completed, reconnect the linkage to its original position.

5. If pressure is incorrect, adjust the pressure setting.

ADJUSTING LOW PRESSURE SETTING

1. Turn "OFF" engine, remove ignition keys and disengage pump.
2. Remove hydraulic tube (part no. 54-7480) located between duo-press valve and the tailgate section. See Figure 22C.

NOTE:

Do not actuate the tailgate raise lever when the hydraulic tube is removed.

NOTE

Trucks with Allison Transmissions equipped with neutral lock-up must have the throttle linkage disconnected when checking and adjusting low duopress setting.

3. Loosen lock nut on back of duo-press valve and turn the assembly "IN" (clockwise) to increase pressure and "OUT" (counterclockwise) to decrease pressure.
4. If correct pressure is not attained, repeat steps 1 thru 3.
5. When correct pressure is attained, reinstall hydraulic tube to ejector and tailgate sections.

DISASSEMBLY/ASSEMBLY OF VALVE SECTIONS

1. Mark each valve section numerically to avoid incorrect reassembly.
2. Remove three (3) assembly stud nuts (see Figure 22D) from the inlet section using a 9/16" thin wall socket.
3. Remove valve sections by sliding from assembly studs, see Figure 22D.
4. Remove and discard o-rings in each section. Thoroughly clean o-ring counterbores and ground surfaces of each section.
5. Replace the four o-rings in each section.
6. Replace valve sections on assembly studs in the same manner in which they were removed. O-ring counterbores should be to the left when facing "A" portend of the valve.
7. Reassemble three (3) stud nuts on stud assembly. Torque nuts evenly to 32 ft./lbs.

NOTE

USE CARE IN REPLACING VALVE SECTIONS TO AVOID DISLODGING O-RINGS FROM COUNTERBORES.

CAUTION

DO NOT USE LOCKWASHERS WITH STUD NUTS. IF STUD NUTS ARE NOT TIGHTENED TO THE PROPER TORQUE, VALVE SPOOLS MAY BIND OR STICK OR CAUSE SECTION SEALS TO EXTRUDE.

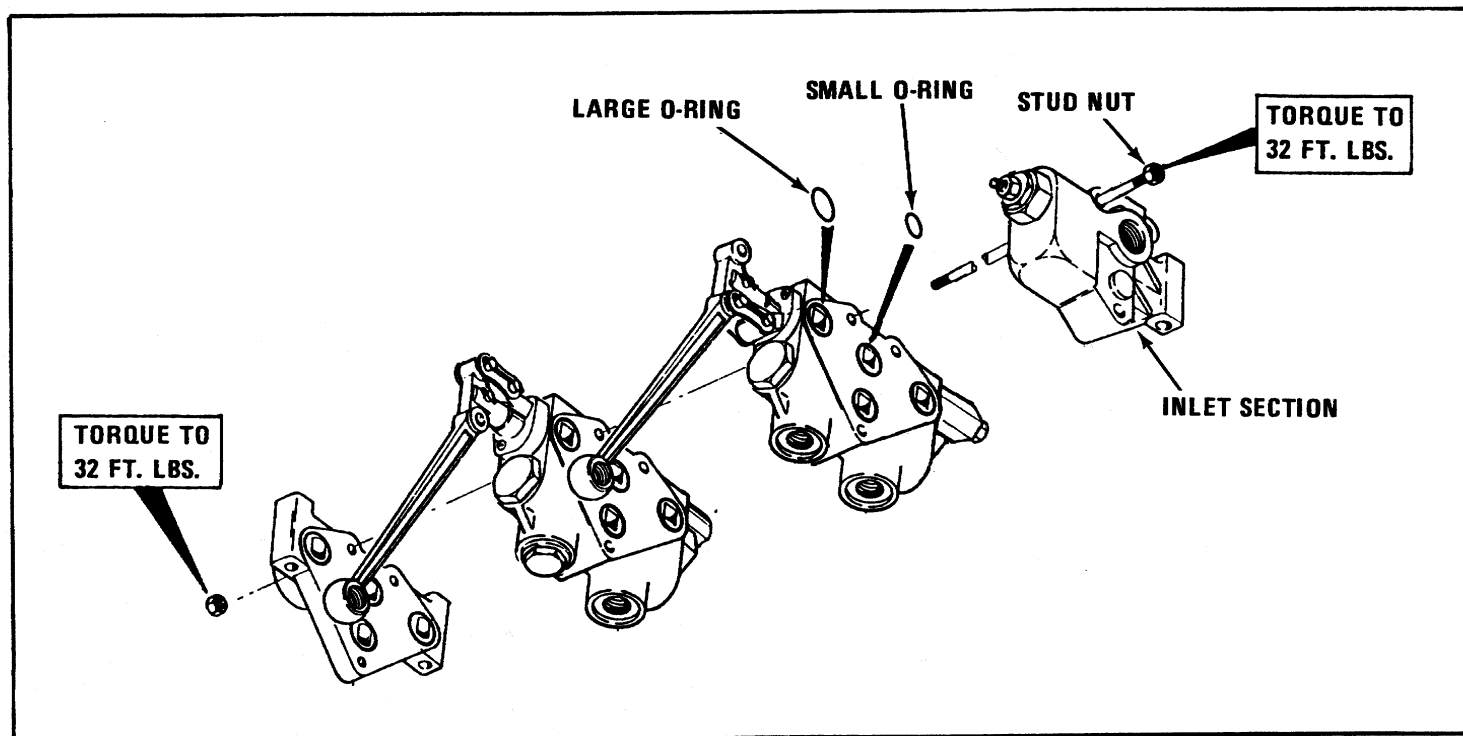


Figure 22D.

REPLACING SPOOL SEALS

1. Remove bonnet assembly parts from back of valve section. Keep parts in order of disassembly, see Figure 22E.
2. Remove complete handle assembly from spool on the front of valve section, see Figure 22E.

NOTE

DO NOT REMOVE spool as the seals can be replaced externally. Prevent spool from turning or moving by inserting a screw driver through clevis slot or running a rod through clevis slot and using a handle. DO NOT hold the spool with a wrench. This will destroy spool finish.

3. Remove retainer plate washer, back-up washer and spool seal, see Figure 22E.
4. Thoroughly clean counterbore.
5. Lightly oil new seal and slide over spool and insert in seal counterbore. Put washers back on spool and reassemble handle assembly. Torque screws evenly to 10 ft./lbs.
6. Reassemble bonnet assembly, making sure it goes together in same order as when removed.
7. Torque bonnet screws evenly to 10 ft./lbs.

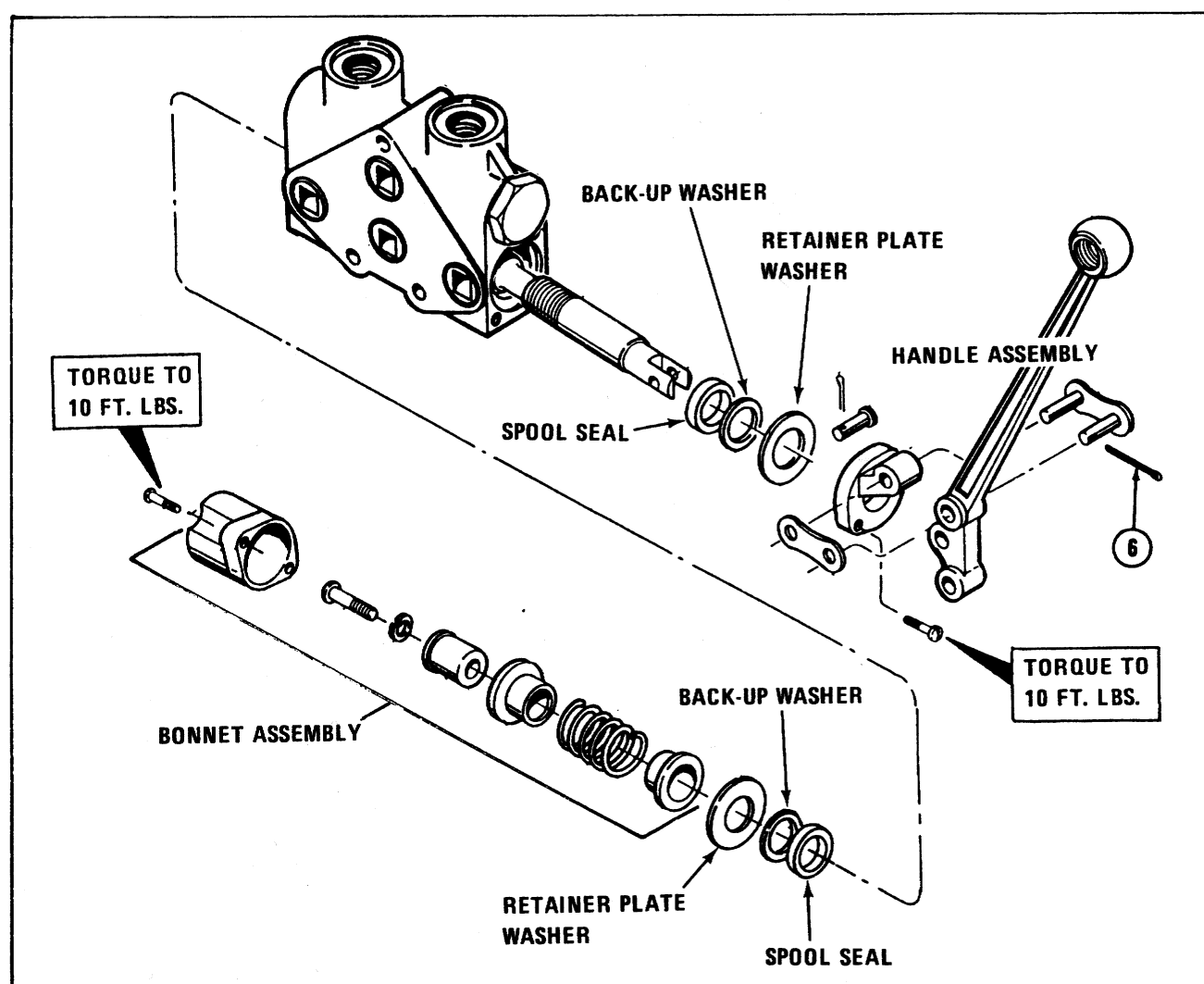
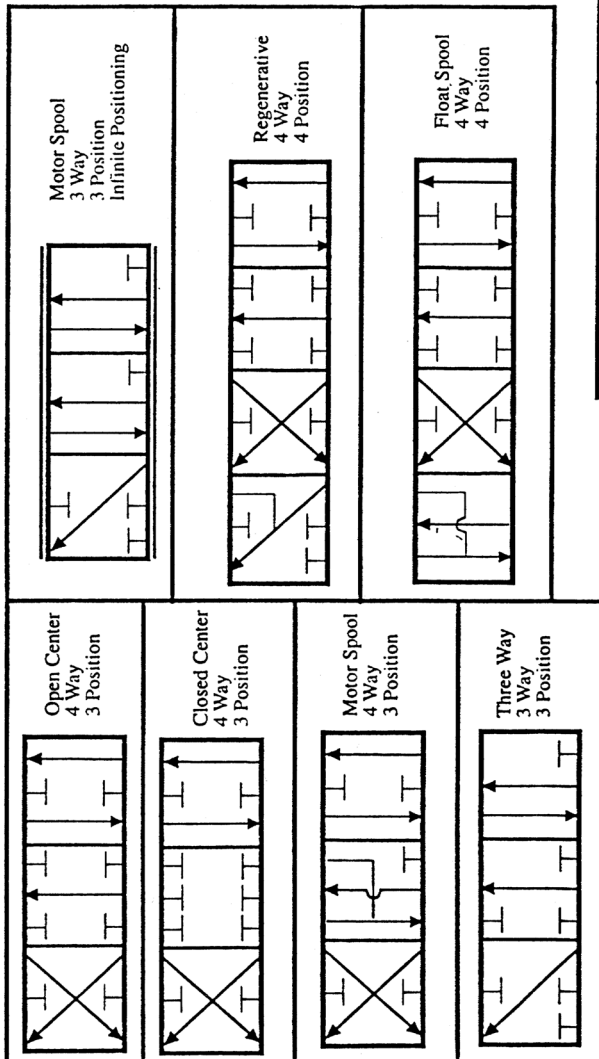


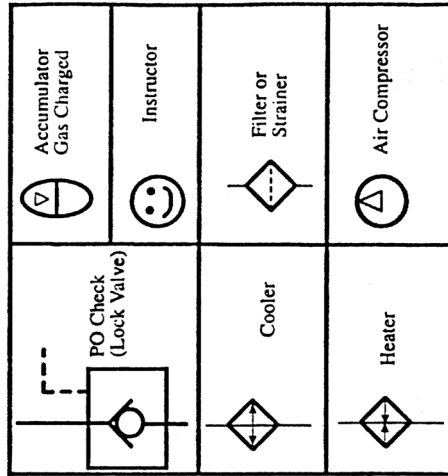
Figure 22E.

HYDRAULIC SYMBOLS

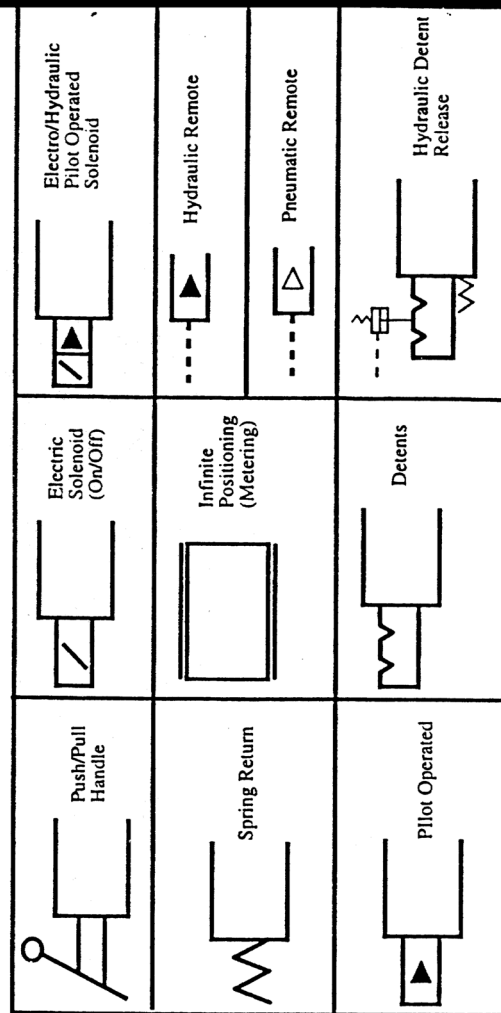
Directional Control Valves



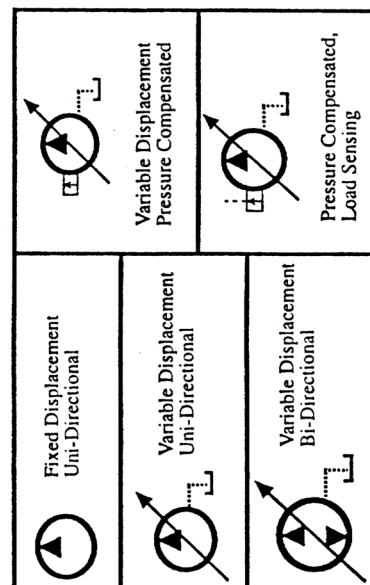
Miscellaneous



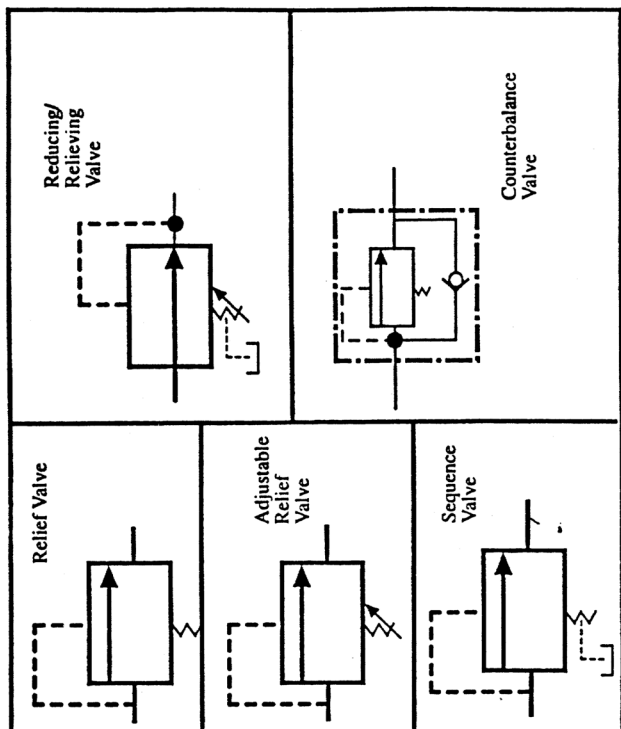
Spool Action Options



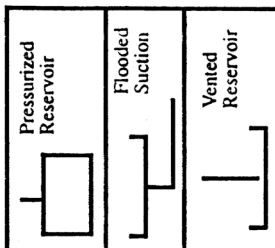
Pumps



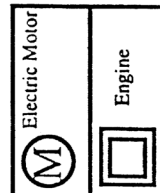
Flow (Volume) Control



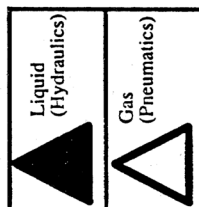
Reservoirs



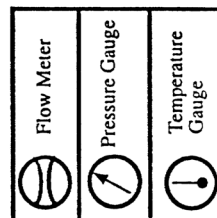
Prime Movers



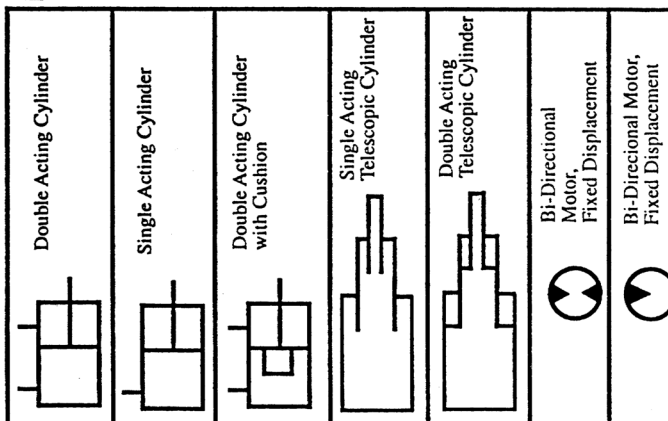
Fluids



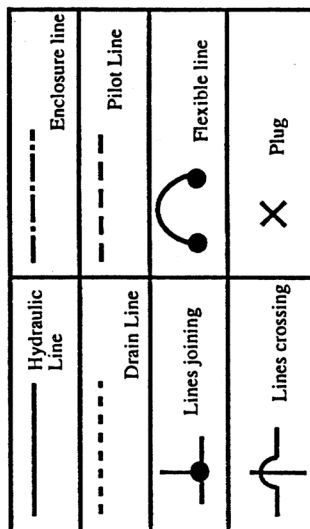
Gauges



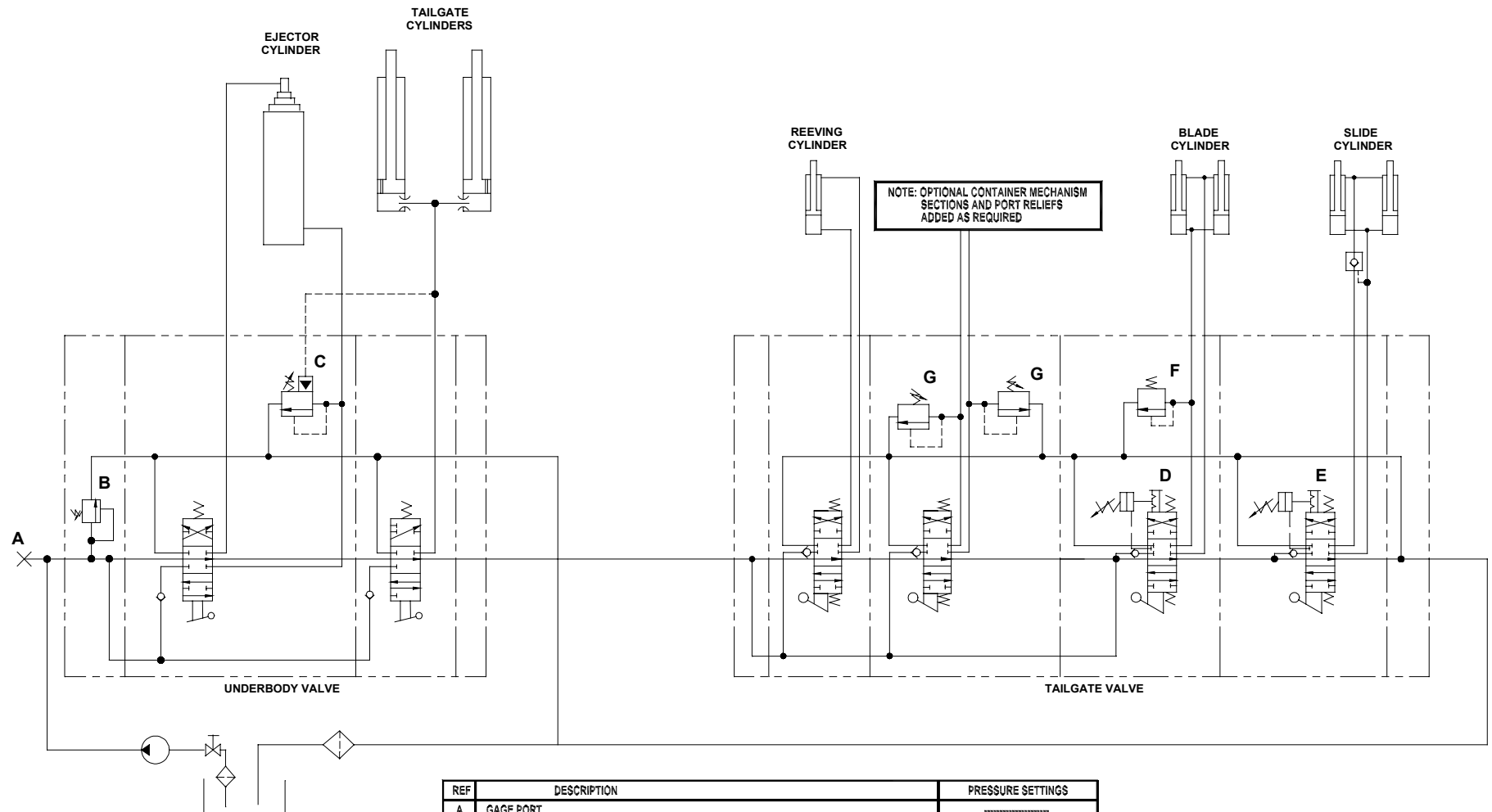
Actuators



Lines

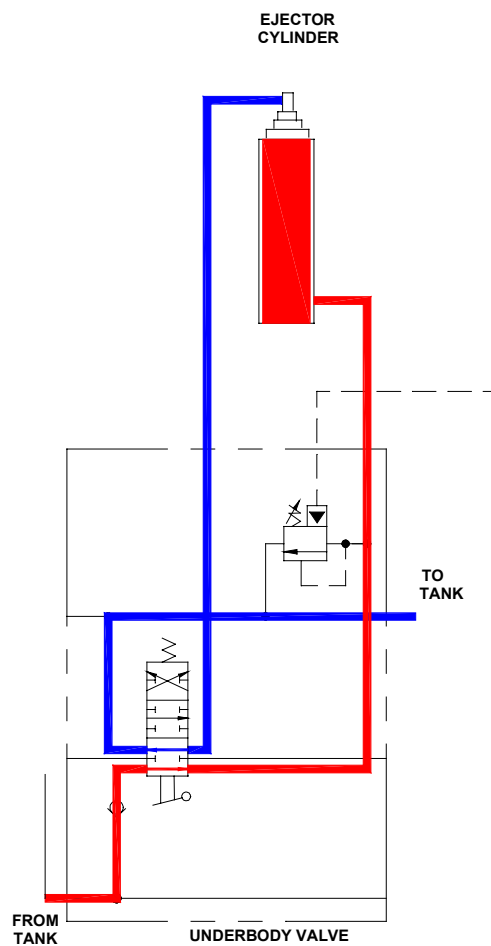


FORMULA 4000 - HYDRAULIC SCHEMATIC

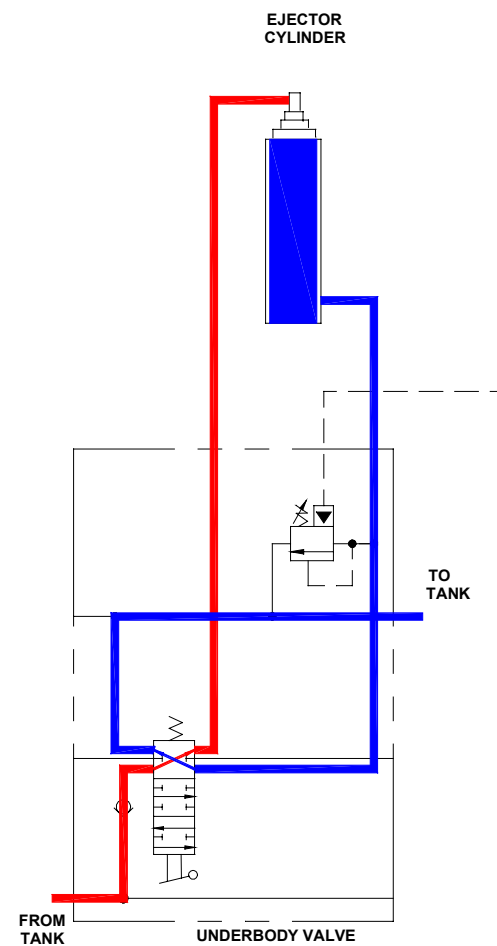


REF	DESCRIPTION	PRESSURE SETTINGS
A	GAGE PORT	-----
B	MAIN RELIEF	2500 PSI
C	EJECTOR TWO STAGE RELIEF	SEE NOTE
D	BLADE PANEL DETENT	2350 PSI
E	SLIDE PANEL DETENT	2450 PSI
F	BLADE PANEL BACK-OFF	2900 PSI
G	OPTIONAL CONTAINER MECHANISM RELIEFS	1400 PSI
	NOTE: EJECTOR TWO STAGE RELIEF LOW PRESSURE	550 PSI (25 YD UNITS) 600 PSI (18 & 20 YD UNITS) 800 PSI (16 or less YD UNITS)
	HIGH SIDE PRESSURE PRESET @ 1400 PSI	

EJECTOR EXTEND



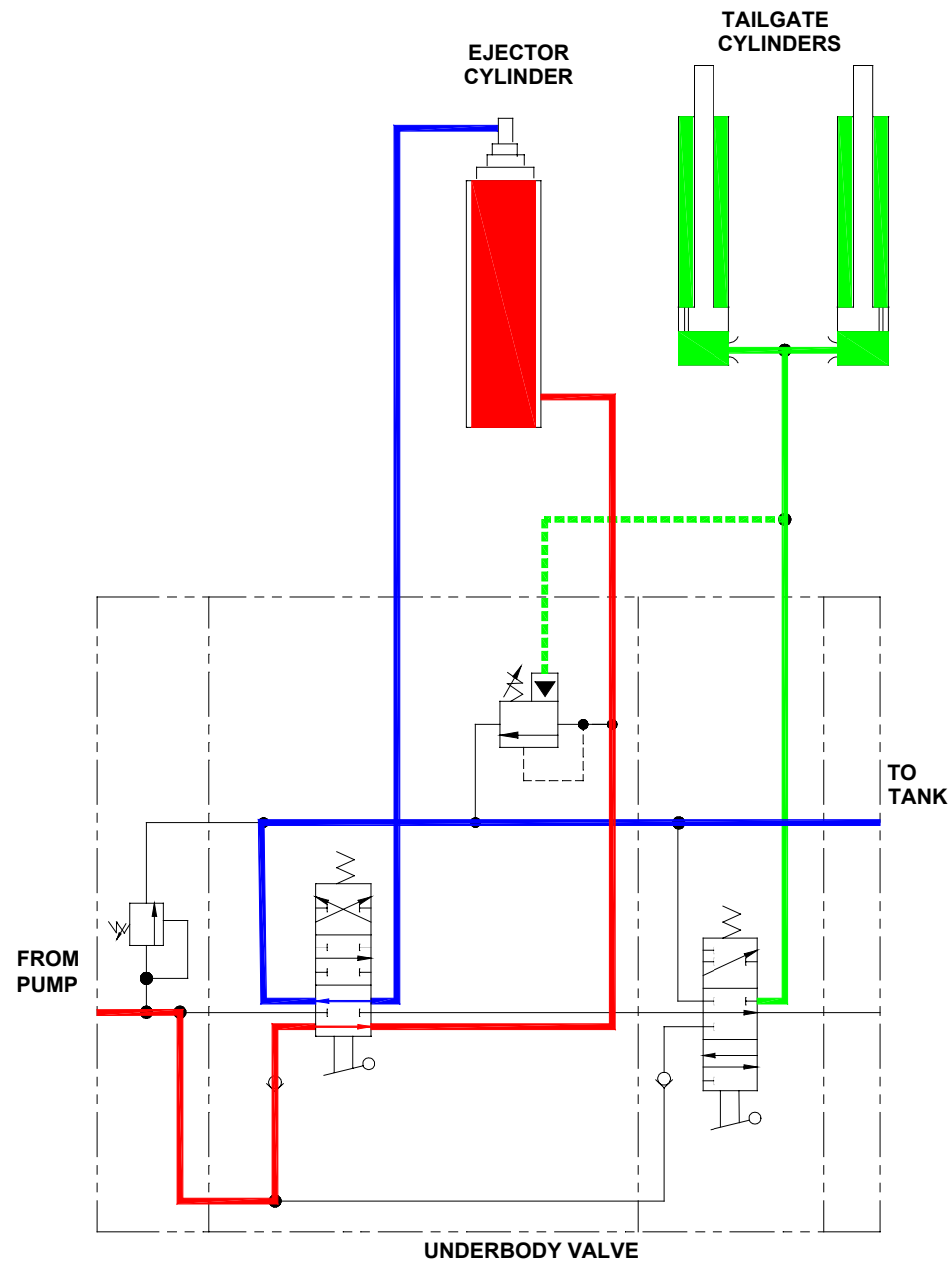
EJECTOR RETRACT



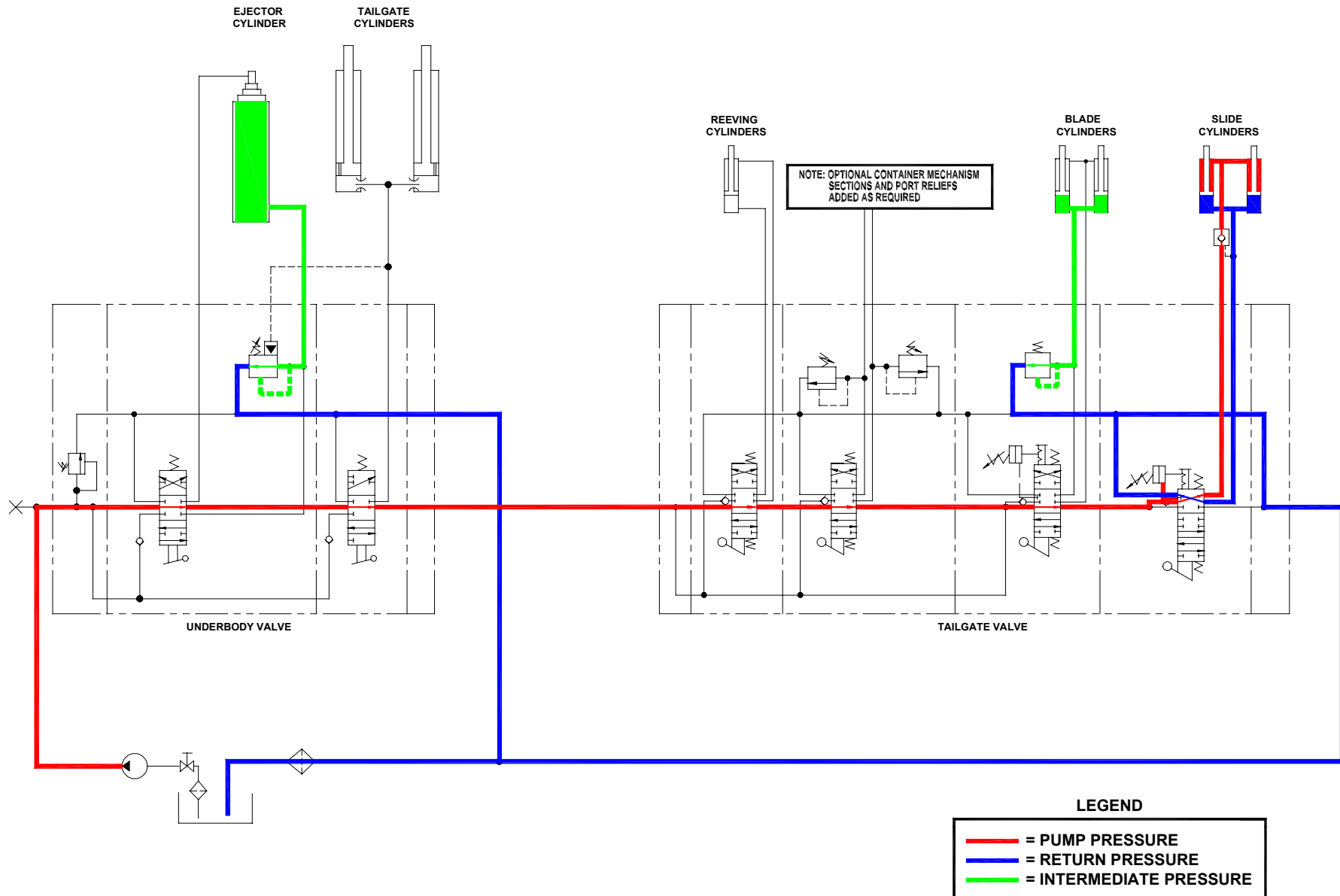
LEGEND

— = PUMP PRESSURE
— = RETURN PRESSURE

EJECTING LOAD WITH TAILGATE RAISED

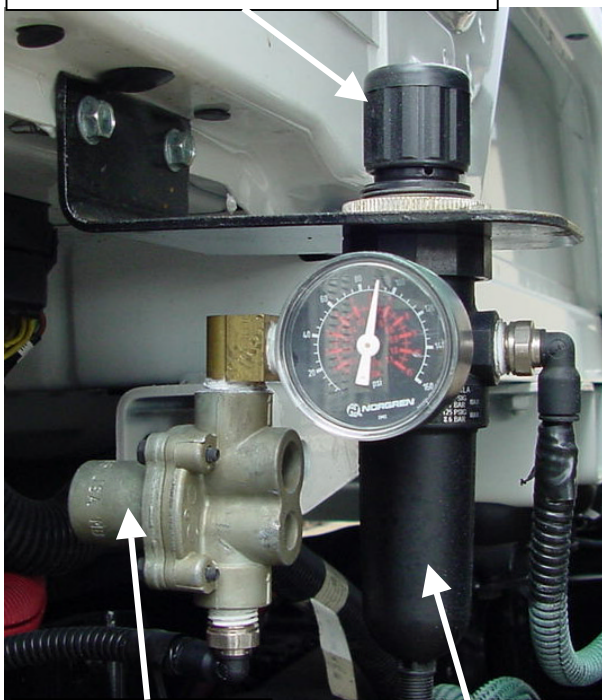


EJECTOR UNLOADING & BLADE BACKING OFF DURING SLIDE IN



AIR SUPPLY KITS PNEUMATIC DIAGRAMS 272-7464

**AIR REGULATOR ADJUSTMENT
KNOB. SET @ 80 PSI
LIFT KNOB TO UNLOCK,
PRESS KNOB TO LOCK**

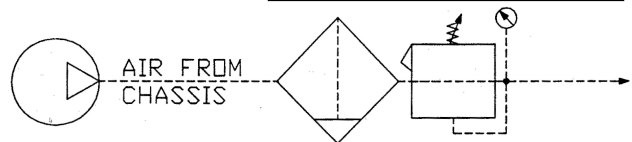


**TRACTOR
PROTECTION
VALVE**

**AIR
FILTER/
REGULATOR**

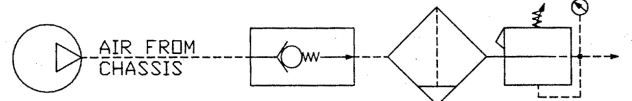
KIT 272-7464-02

**ADJUST REGULATOR TO
80 PSI**



KITS 272-7464-01, 272-7464-03

**ADJUST REGULATOR TO
80 PSI**



SECTION 6

TAILGATE SERVICE MANUAL



A  **DOVER** COMPANY

SECTION 6 - TAILGATE

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SPECIFICATIONS

Hydraulic Cylinders:

Blade (lower panel)	4" Bore x 21-5/8" Stroke
Slide	4-1/2" Bore x 26-1/2" Stroke
Tailgate Raise	3" Bore x 31" Stroke
Container Arm	3" Bore x 18-7/16" Stroke
Roll Bar	2-1/2" Bore x 14-1/2" Stroke
Reeving.....	5-1/2" Bore x 49-3/4" Stroke

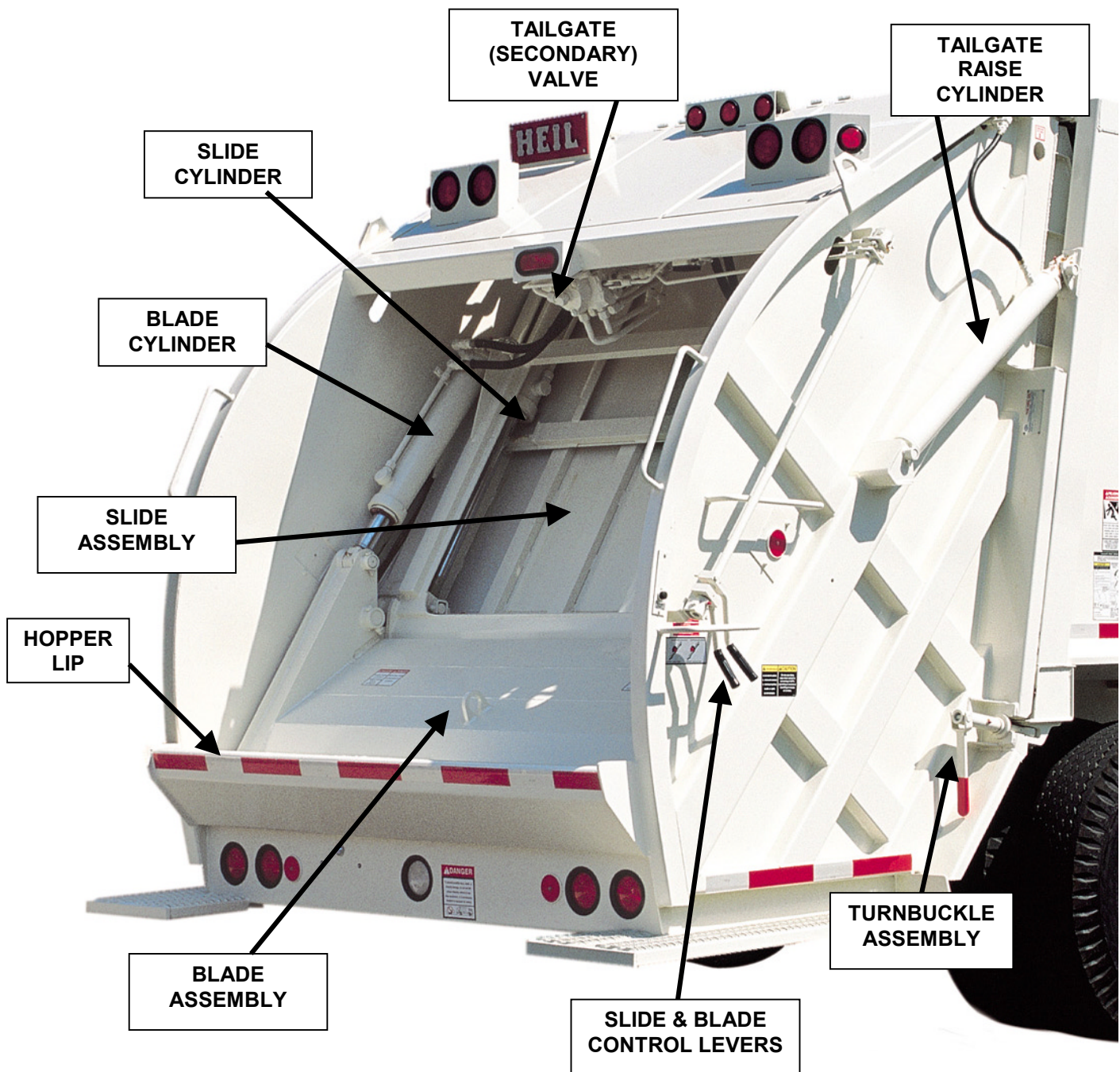
Tailgate Valve:

Blade (Lower Panel)	2300 PSI
Slide Detent	2400 PSI
Blade Back-Off Relief.....	2900 PSI
Optional Mechanism (Winch, Roll Bar)	1400 PSI

Tailgate Packer Mechanism Cycle Times (Empty Hopper);

Non Regen @ 28 GPM).....	22 to 26 Seconds
Regen @ 28 GPM.....	15 to 17 Seconds

TAILGATE NOMENCLATURE



Shown are some of the features of the F4000 tailgate.



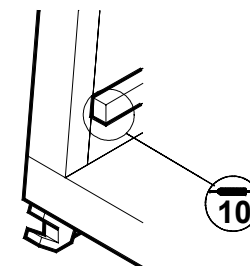
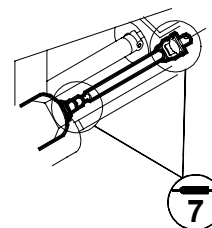
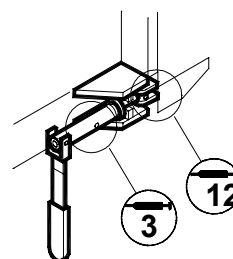
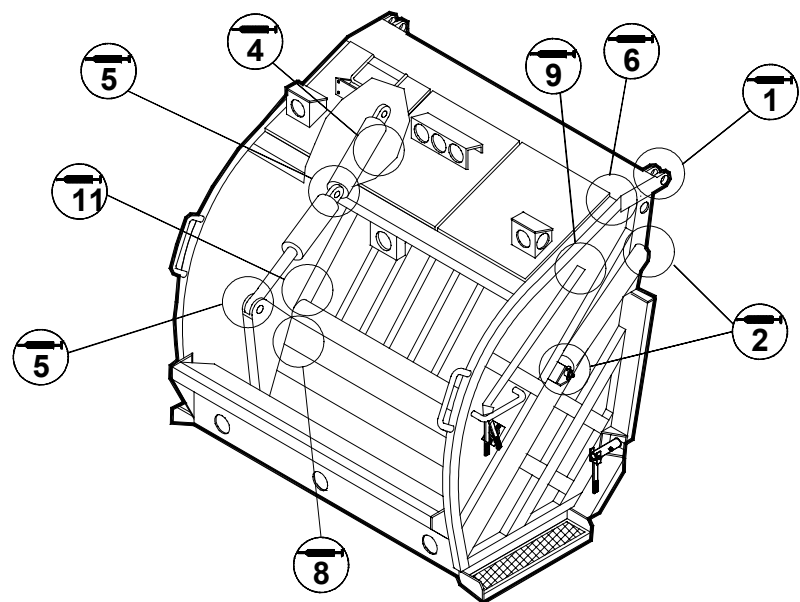
Formula 4000 Lubrication Guide

Note: Use No. 1 pressure gun grease. Clean fittings before applying grease and always pump enough grease into joint to remove the old grease. Wipe off excess.

REF. NO.	LOCATION	QTY.	INTERVAL
1	Tailgate Hinge	2	Weekly/40 Hours
2	Tailgate Cylinders (2/Cyl.)	4	Weekly/40 Hours
3	Tailgate Turnbuckle Clamp	2	Weekly/40 Hours
4	Slide Cylinders (1/Cyl.)	2	Weekly/40 Hours
5	Blade Cylinders (2/Cyl.)	4	Weekly/40 Hours
6	Inner Slide Pivot	2	Weekly/40 Hours
7	PTO Drive Shaft	4	Weekly/40 Hours
8	Blade to Slide Bearing	2	Weekly/40 Hours
9	Tailgate Control Levers	2	Weekly/40 Hours
10	Ejector Panel Tracks	4	Grease Monthly/ Every 200 Hours
11	Blade Shoe	2	Weekly/40 Hours

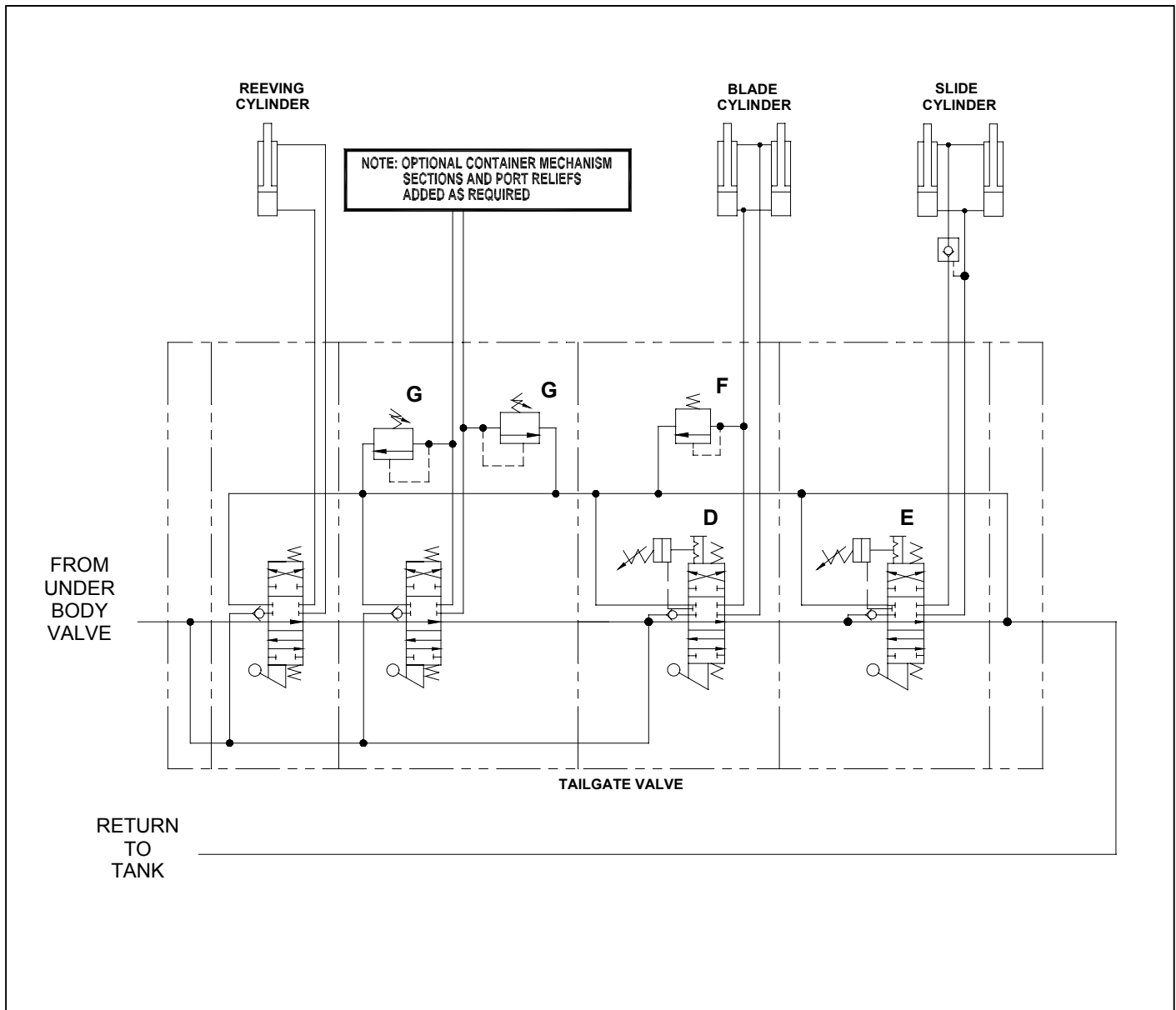
OIL CAN LUBRICATE

12	Tailgate Eye Bolts	-	Weekly/40 Hours
13	Ejector Control Lever (Not Shown)	-	Weekly/40 Hours
14	Access Door Hinges and Handle Pivot (Not Shown)	-	Weekly/40 Hours

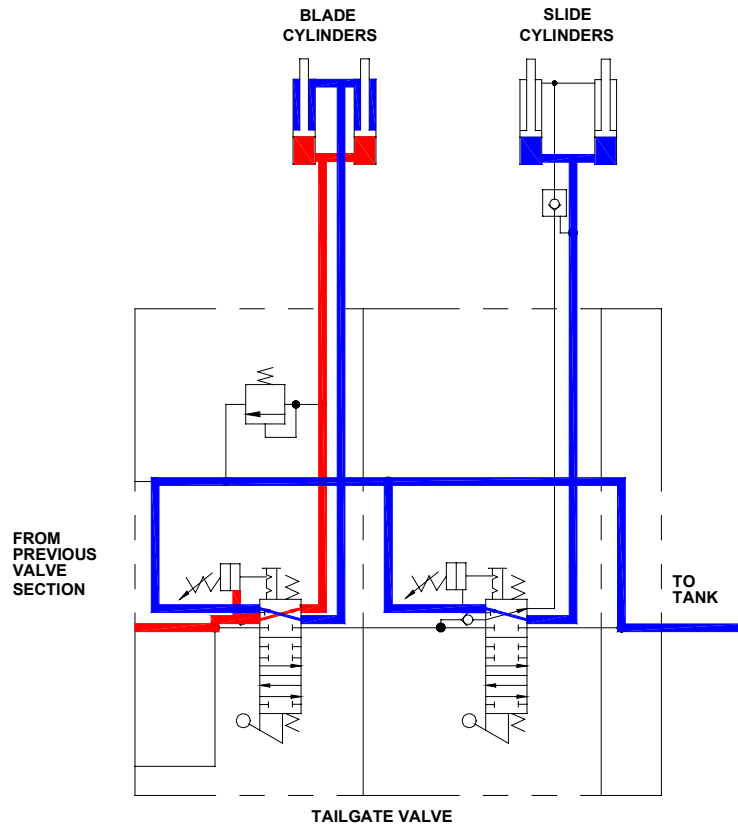


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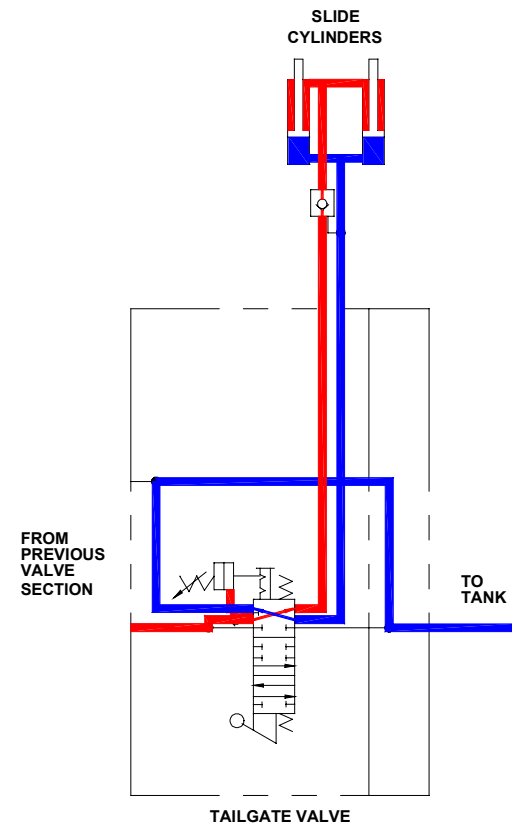
HYDRAULIC SCHEMATIC



BLADE DOWN



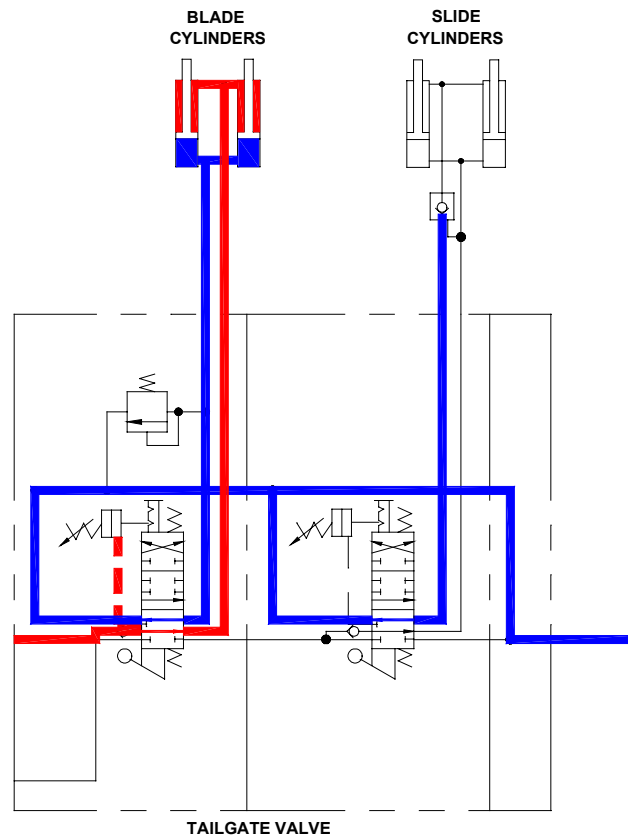
SLIDE IN



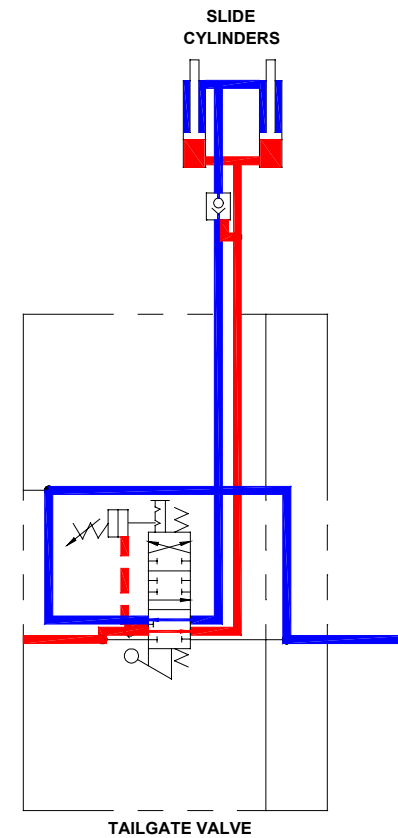
LEGEND

- = PUMP PRESSURE
- = RETURN PRESSURE

BLADE UP



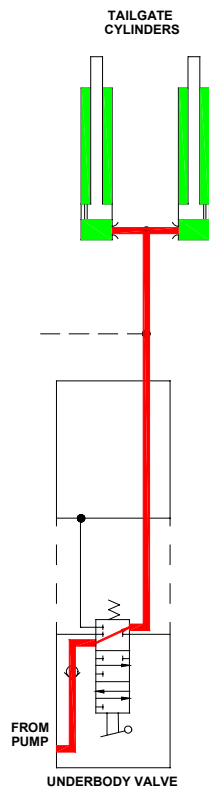
SLIDE OUT



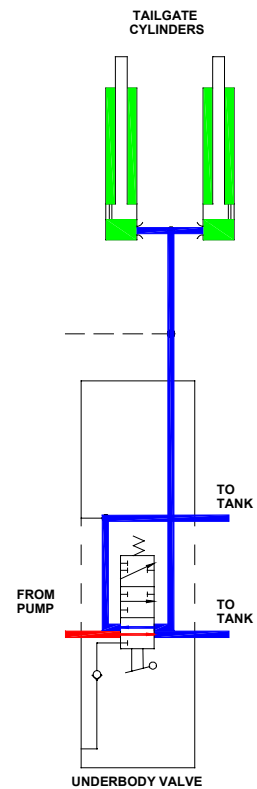
LEGEND

- = PUMP PRESSURE
- = RETURN PRESSURE

TAILGATE RAISE



TAILGATE LOWER

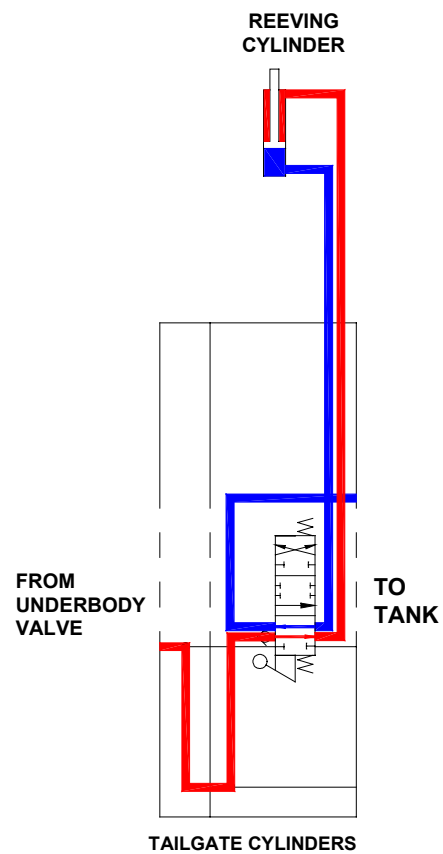


LEGEND

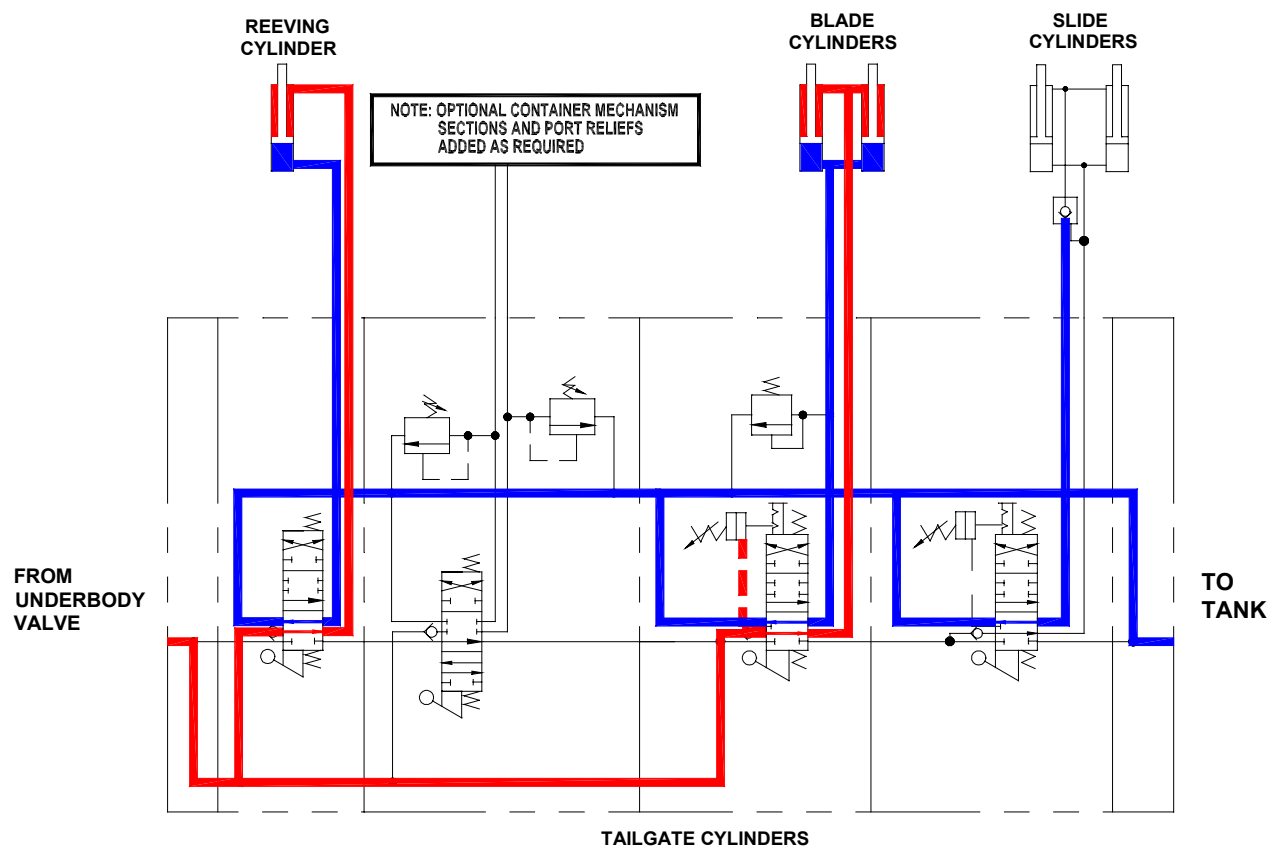
- = PUMP PRESSURE
- = RETURN PRESSURE
- = INTERMEDIATE PRESSURE

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REEVING CYLINDER LOWERING CONTAINER



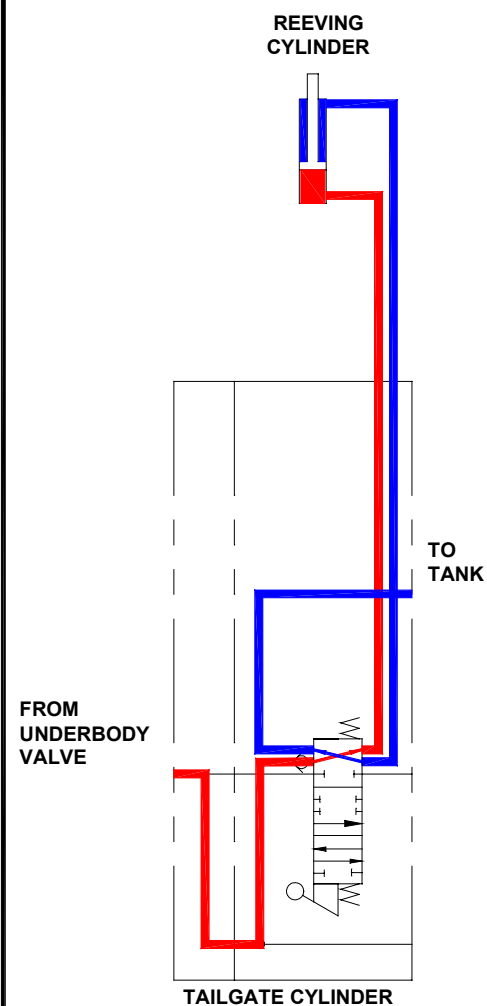
REEVING CYLINDER LOWERING CONTAINER DURING BLADE UP



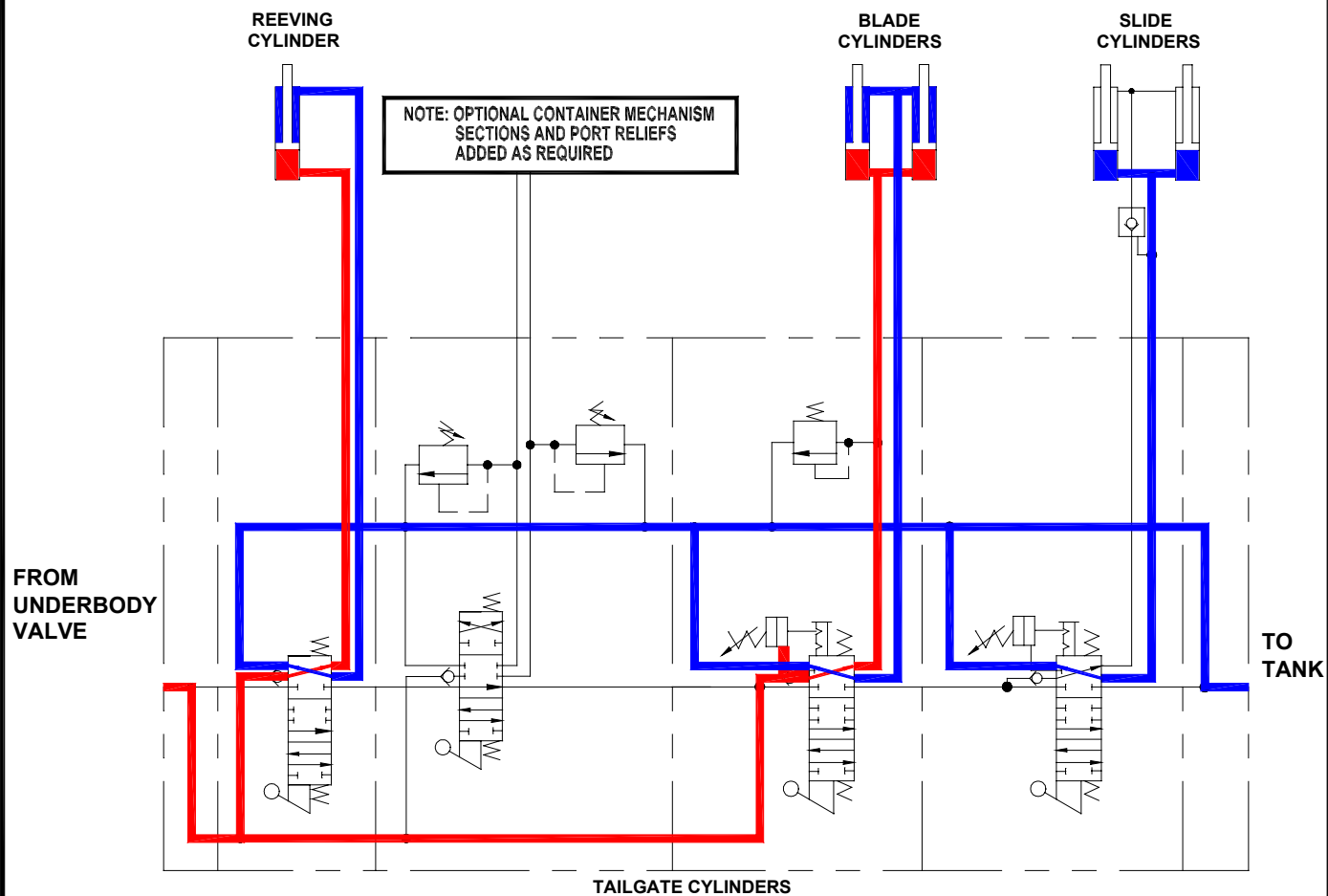
LEGEND

— = PUMP PRESSURE
— = RETURN PRESSURE

REEVING CYLINDER RAISING CONTAINER



REEVING CYLINDER RAISING CONTAINER DURING BLADE DOWN



LEGEND

— = PUMP PRESSURE
— = RETURN PRESSURE

TAILGATE (SECONDARY) VALVE

This valve controls the packing mechanism through the complete cycle. With this control valve, the position of the blade and slide and their respective cylinders can be positioned as desired. (Refer to Operator's Manual for complete operational instructions). This valve uses separate valve sections that are bolted together.

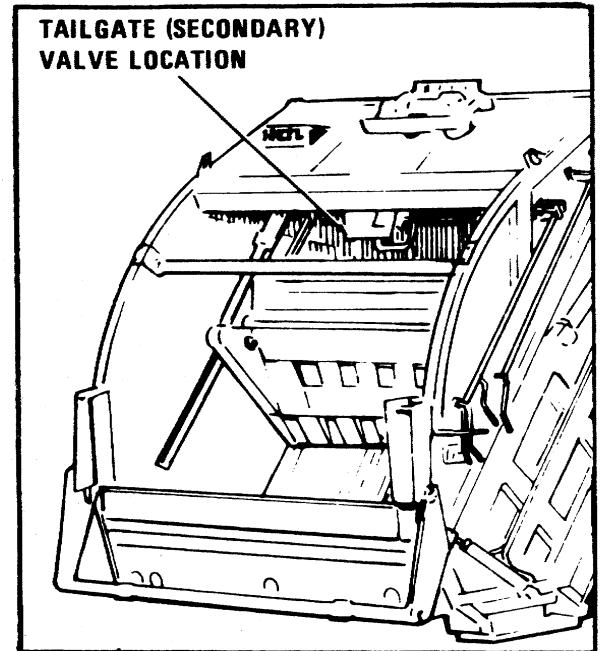


Figure 23. Tailgate (Secondary) Valve Location

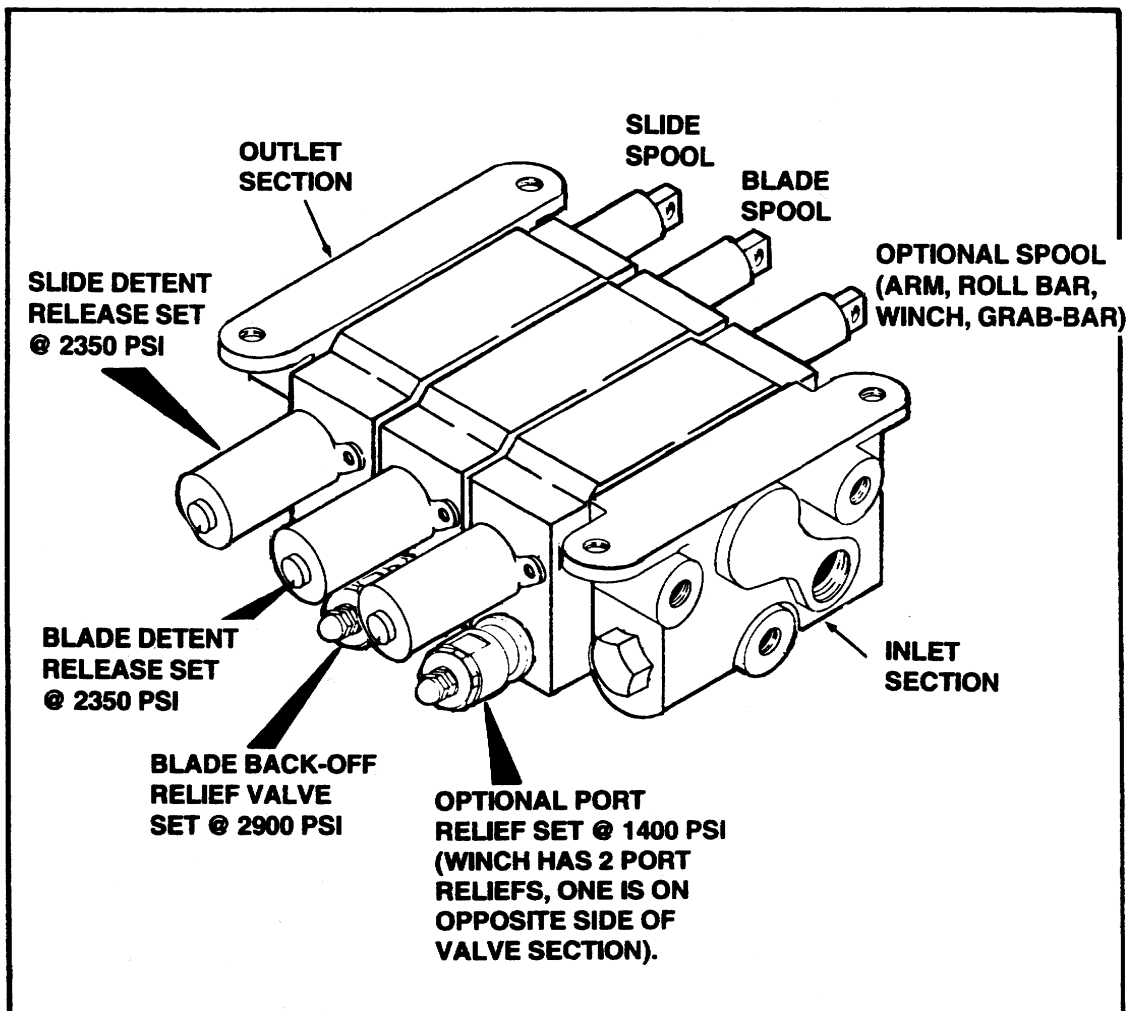


Figure 24.

BLADE AND SLIDE DETENT ADJUSTMENT PROCEDURE

Each spool is held in the shifted position by a detent mechanism until the stroke of its cylinders has been completed. At this point hydraulic pressure increases to a predetermined point then the detent mechanism shifts the spool back to neutral. To adjust and check the operation refer to this procedure.

Install a 3000 PSI gauge in the PRIMARY CONTROL valve at the 90° elbow tapped for 1/4" NPT gauge connection.

BLADE DETENT ADJUSTMENT

Blade Kick-Out Pressure:

Units Serial Number 9616 and After ... $2350 + \frac{50}{0}$ PSI

1. Position the packing mechanism to blade down and slide out.
2. Turn OFF PTO (or front mount pump).
3. Turn off ignition, remove key and follow a lock out procedure.
4. Remove blade control linkage on secondary valve, see figures 24 for valve spool.
5. Engage blade spool by hand (in either direction).
6. Lower main relief pressure in Primary (Underbody) Valve two (2) turns out (counterclockwise). Refer to Main Relief Adjustment on page 9.19.
7. Start engine.

IMPORTANT! Be sure all persons are clear of the packing mechanism.

8. Engage PTO (or front mount pump).

9. Depress engine throttle advance.

10. Slowly increase the main relief pressure and note the pressure when the spool kicks out of detent (returns to neutral). See chart for correct kickout pressure for your unit.

11. If setting is incorrect, remove the rubber plug on the end of the blade spool to expose the detent release adjustment screw, see figure 25.

12. Insert screwdriver and turn adjustment screw in (clockwise) to increase kickout pressure or out (counterclockwise) to lower kickout pressure.

One revolution of the adjustment screw is approximately equal to a 800 PSI change in the kickout pressure.

NOTE:

Be careful not to force the adjusting screw or it may deform the internal adjusting rod and make the valve inoperative.

Be sure the internal spool does not turn in the valve while making this adjustment by holding the linkage end of the spool being adjusted, see figure 25.

CAUTION

Do not stand in the hopper or on the hopper sill while adjustments are being made on the packing mechanism with the machine running.

13. Engage the blade spool and re-check the pressure by following steps 3 through 8 again.

14. Once blade detent pressure is set, re-connect the blade spool linkage and proceed to the slide detent adjustment.

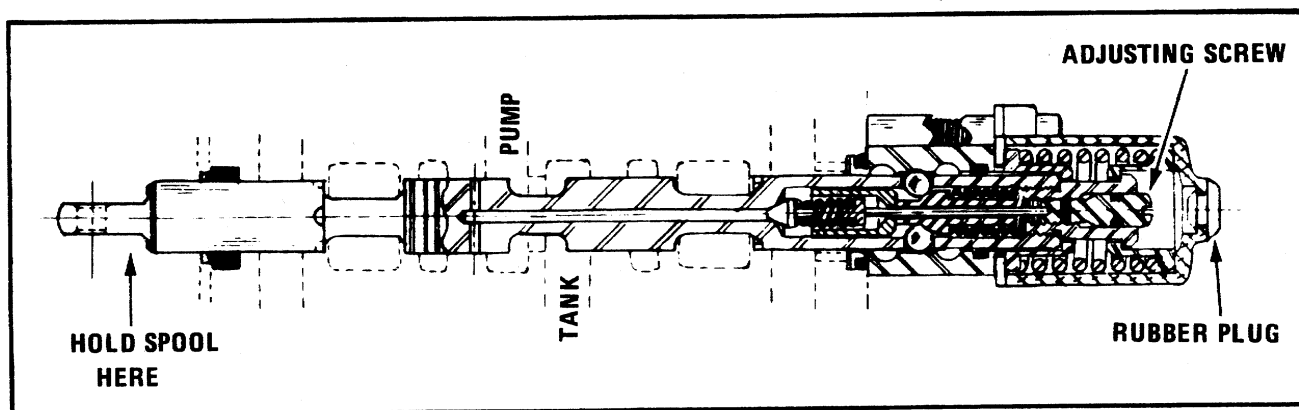


Figure 25. Blade/Slide Spool Detent Mechanism

SLIDE DETENT ADJUSTMENT

Slide: Kick-Out Pressure:

Units Serial Number 9616 and After ... $2350 + \frac{50}{0}$ PSI

1. Position the packing mechanism to blade down and slide out.
2. Turn off PTO (or front mount pump).
3. Turn off engine, remove keys and follow a lock out procedure.
4. Remove slide control linkage on secondary valve (bottom valve spool).
5. Follow the same procedure to check and set slide detent pressure as blade detent adjustment (except operate slide spool).
6. After detent pressures are set re-connect all linkages and reset the main relief pressure (refer to MAIN RELIEF ADJUSTMENT PROCEDURE ON PAGE 9.19).

OPTIONAL CONTAINER MECHANISM ADJUSTMENT PROCEDURE

Install a 3000 PSI gauge in the PRIMARY VALVE at the 90° elbow tapped for 1/4" NPT gauge connection, MAKE SURE GAUGE HAS BEEN CHECKED FOR ACCURACY.

A. Winch

1. Disengage PTO.
2. Remove the hoses or tubes and fittings connecting the valve to winch at the SECONDARY VALVE ports.
3. Install "O" rings plugs in two secondary valve ports.
4. Engage PTO.
5. Depress throttle advance and engage the winch control lever in both directions.
6. The pressure should read 1400 PSI \pm 100 PSI for 8000# and 12,000# winches.
7. If pressure is incorrect, make the necessary adjustment by the following procedure:

- a. Remove the cover nut which will expose the adjustment screw.
 - i. Pull spool out to adjust relief on detent cup end.
 - ii. Push spool in to adjust relief on spool yoke end.
 - b. Loosen the lock nut.
 - c. Turn adjustment screw clockwise (IN) to increase the pressure, counterclockwise (OUT) to decrease the pressure.
 - d. After proper pressure is reached tighten the locknut and re-install cover nut.
8. Reconnect fittings, hoses or tubes; if applicable.

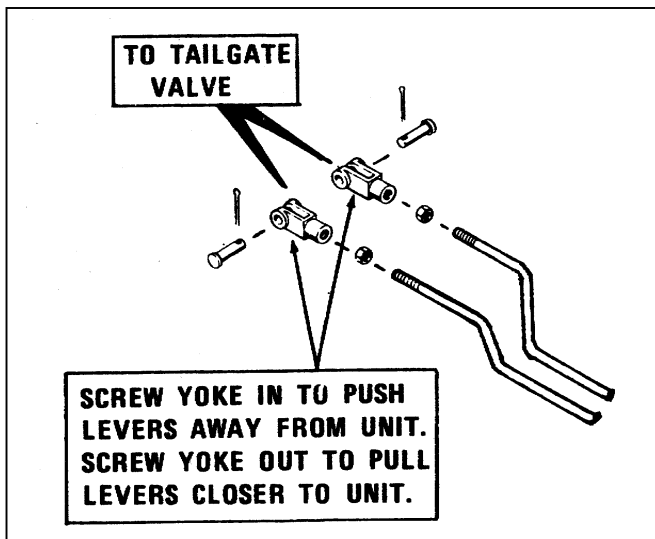
B. Container Mechanism or Roll Bar (Without Winch - Single Mechanism)

1. Engage PTO.
2. Depress throttle advance and engage mechanism control lever until cylinders bottom out (check in both directions).
3. The pressure should read 1400 PSI \pm 100 PSI in with cylinders extended.
4. If pressure is incorrect, make the necessary adjustment by the following procedure:
 - a. Remove the cover nut which will expose the adjustment screw.
 - i. Pull spool out to adjust relief on detent cup end.
 - ii. Push spool in to adjust relief on spool yoke end.
 - b. Loosen the lock nut.
 - c. Turn adjustment screw clockwise (IN) to increase the pressure, counterclockwise (OUT) to decrease the pressure.
 - d. After proper pressure is reached tighten the lock nut and re-install cover nut.

TAILGATE (SECONDARY VALVE) LINKAGE ADJUSTMENT

1. Loosen the jam nut behind the yoke.
2. Screw the yoke OUT to pull levers closer to the unit.
3. Screw the yoke IN to pull levers away from the unit.
4. Reassemble and check.

The control levers need to be in the same relative position to each other and not hit the body or the lever guard. After the proper position is attained, tighten the jam nut against the yoke and reinstall linkage to valve spool.



MAINTENANCE OF WEAR SURFACES

CAUTION

Structural damage may occur when the wear surfaces are completely worn through. Replace as often as condition dictate.

The unit is equipped with one piece blade shoes (part no. 028-0358). These shoes do not have any replaceable wear surfaces, but should be check periodically and replaced when the surface is worn to a thickness of 1/8" or less.

Remove the shoe block as follows:

1. Remove reflectors on the side of the tailgate to expose the holes.
2. Extend the blade full down and the bearing block pin at the hole.
3. Turn off the truck and follow a lockout procedure.
4. Attach an overhead crane or fork truck and cable to the blade eye.
5. Remove pins.
6. Slide bearing blocks down and out.
7. Inspect the blade shoe pivot bearing each time the shoe block is reversed or replaced.

After obtaining a new bearing block install in reverse order. Before re-installing the pin coat with anti-seize.

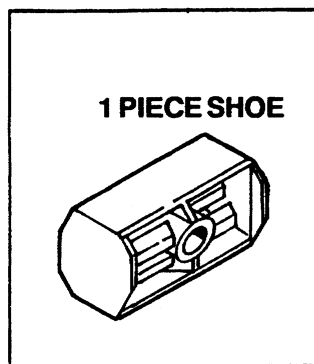


Figure 8. Blade Shoes.

BLADE SHOE BEARING - (IN BEARING BLOCK)

This bearing is a self lubricating non-metallic bearing. Replace this bearing when the bearing to pin gap is $\frac{1}{8}$ " or more.

Follow the same procedure for removal and re-installation as described for Blade Shoe Bearing procedure.

INNER SLIDE WEAR STRIPS

This bearing is also a self lubricating non-metallic bearing. Replace these wear strips before they wear down to the button head capscrews they are secured

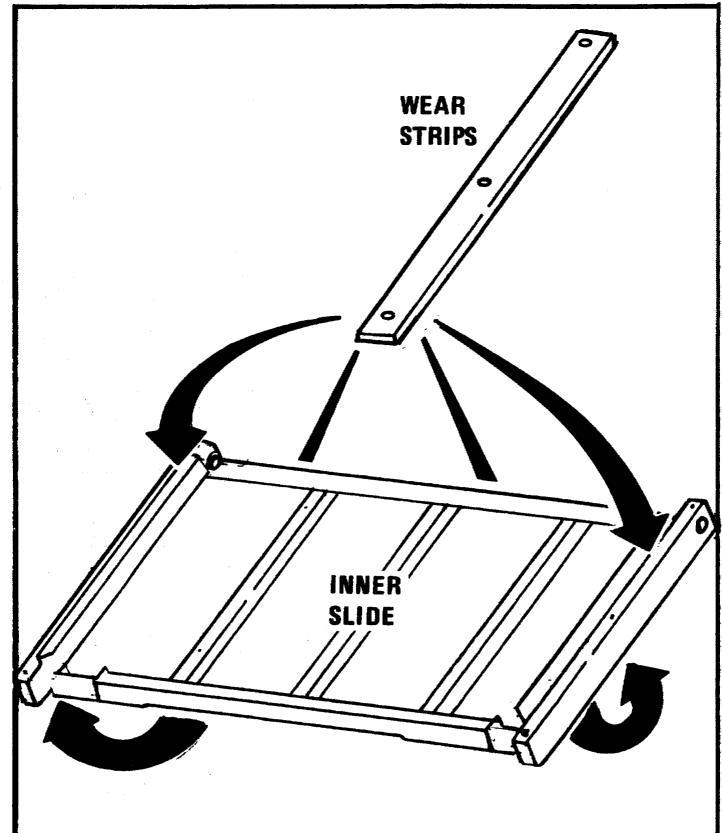


Figure 9. Slide Wear Strips

with. Fully extend the slide. Inspect the two outer wear strips from inside the tailgate. Inspect the underside wear strip from inside the body.

Remove worn strip and replace with new wear strips by removing the blade and slide assembly. Refer to removal of Blade and Slide assembly.

EJECTOR ROLLERS

The ejector has two rollers on each side. On a monthly basis inspect for signs of flattened rollers dragging on the tracks. If the roller is flattened it will leave a highly polished appearance on the forward four to five feet of the track.

Once each year the ejector should be pulled to inspect the rollers. Follow the procedure in this manual for removing the ejector. When replacing the roller grease the roller before re-installing.

BLADE TO SLIDE PIVOT BEARING

The blade to slide pivot bearing is of hardened steel with grease provisions. If removal of the bearing or pin is required, refer to the "Blade Removal Procedure".



CAUTION

Before entering the body area, place the unit in LOCK-OUT. To place unit in LOCK-OUT, stop the engine, set the brakes and make sure the brakes are holding and working properly, chock all wheels, remove the keys from the cab and insert a LOCK-OUT tag onto steering wheel.

TAILGATE PROPS

Whenever the tailgate is opened for service or maintenance, the following procedures must be followed.

IMPORTANT: TAILGATE MUST BE FREE OF REFUSE AND ALL PERSONS CLEAR OF TAILGATE BEFORE PERFORMING THE FOLLOWING STEPS.

⚠ CAUTION

TWO PROPS ARE INSTALLED ON THE TAILGATE BOTH MUST BE USED

USE OF PROP

1. Set unit on level surface and apply parking brake.
2. Raise tailgate, see Figure 12.
3. Turn out on screw to allow props to rotate down to support position, see Figures 13 and 14.
4. Lower tailgate until props mate with body, see Figure 14.
5. Turn off engine and remove ignition key.

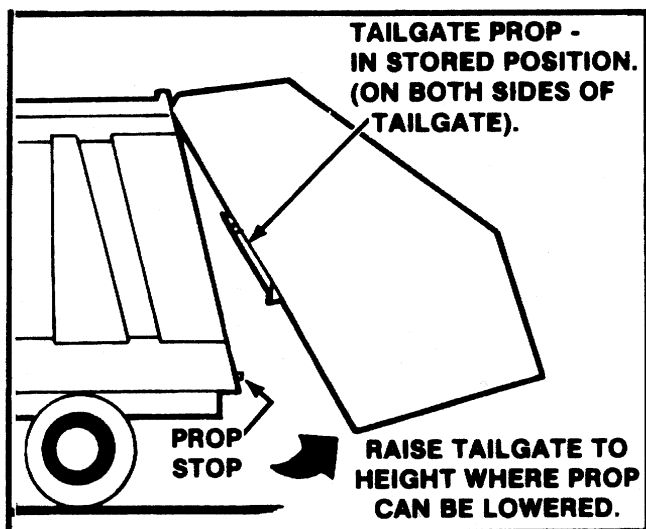


Figure 12. Raise Tailgate

TO STORE PROPS

1. Raise tailgate slightly.
2. Rotate props to stored position and turn in on screw until it is tight.

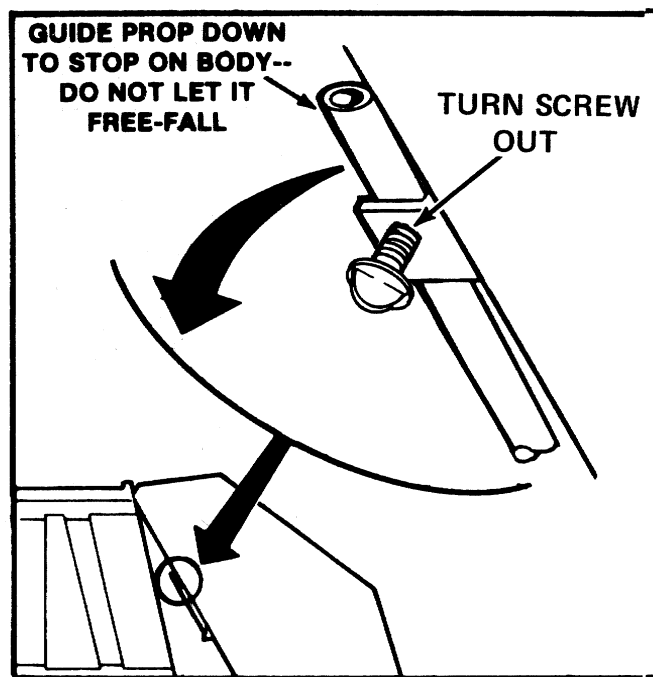


Figure 13.

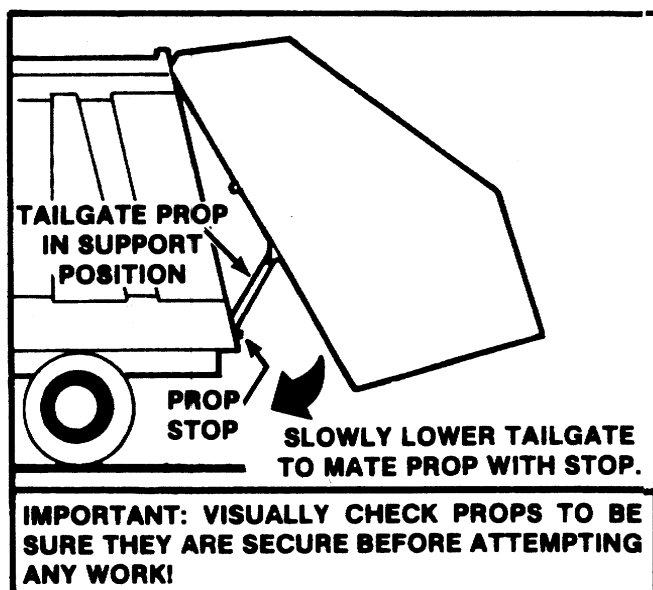
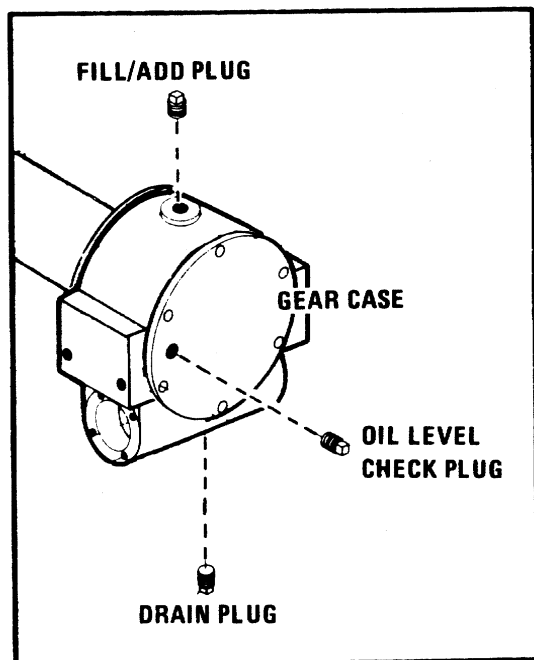
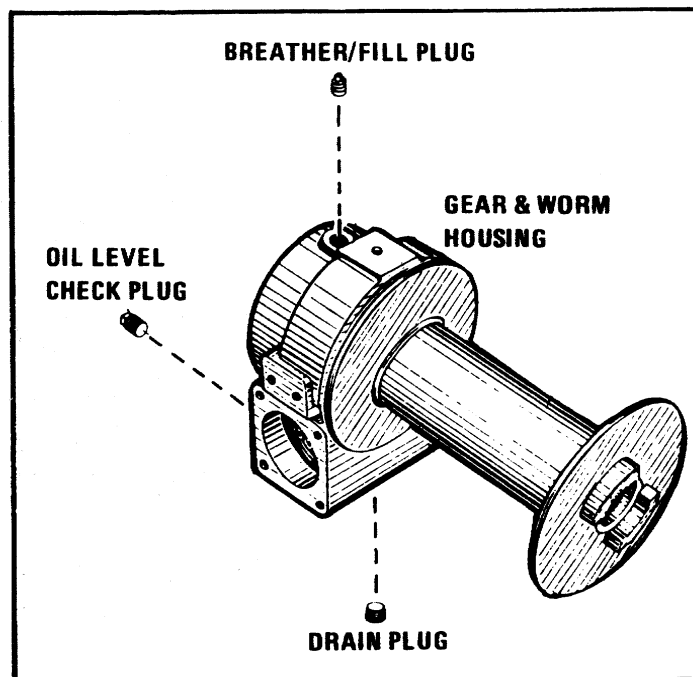


Figure 14.

OPTIONAL WINCH OIL LEVEL CHECKING PROCEDURE

Check winch oil level every 2 months or 400 hours, whichever comes first, see Figures 6 and 7

If low on oil, add AGMA Grade 5 EP (90 wt.) gear oil to 8,000 lb. winches and AGMA Grade 7EP (140 wt.) gear oil to 12,000 lb. winches. (Example of brand name is Texaco Meropa 220 and Texaco Meropa 460). Be sure lubricant added is functional equivalent of brand name.

8,000 LB. WINCH**Figure 6.****12,000 LB. WINCH****Figure 7.**